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IN DAEDALUS' WORKSHOP

TECHNIQUE AND THE DYNAMICS OF INVENTION IN ORGANIZATION STUDIES

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Daedalus and the Labyrinth (Holroyd, 1895)

Declaration of authenticity and author's rights

This thesis is the result of the author's original research. It has been composed by the author and has not been previously submitted for examination which has led to the award of a degree.

Signed:  **Date: 26th March 2019**

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I would like to dedicate this work to my supervisors, Professor Barbara Simpson and Dr Alia Weston, to my brother Kevin, and to my love, Emma.

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ES ◦ ILY ◦ MTTMATS ◦ AAF ◦ WGTLPAC ◦ RMM

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Abstract

This study proposes an alternative vision of organizational creativity by examining the hidden nature of technique and its role within the production of new things. Taking the figure of Daedalus as an eponym for technical activity, this study asks how technique can be understood as contributing toward creative practice. It is argued that a consideration of technique reveals the hybrid relations formed between humans and technical objects within the process of production. Such relations are found to be incompatible with current theories of organizational creativity, which fail to recognise both the role of technical objects and their attendant techniques, resulting in an incomplete account of how creative outcomes are achieved. A potential solution to this issue may be found within the theory and practice of design, which, through an appreciation of the form and content of its own process and outputs, moves away from the image of an individual creator who preconceives forms in advance of their technical implementation. To explore these issues, this study draws upon fieldwork collected at two design-led organizations and develops the 'Dynamics of Invention': a series of guiding concepts designed to help navigate the tangled paths of creative production.

This study offers four contributions to the field of process organization studies. First, it provides the resources for understanding technique from a process perspective, and highlights its value for exposing the inherently technical nature of organizational life. Second, it extends and offers a critical dialogue with process perspectives of

technical action, such as Actor-Network Theory and related theories of technical assemblages. Third, it offers a critique of the dominant perspectives within the field of organizational creativity, which, without a consideration of technical activity are likely to remain the preserve of the creative individual. Finally, it offers the 'Dynamics of Invention' as a guide to creative practice, affirming the inherent technicity of creating within organizations.

CONTENTS

List of Illustrations

Prologue: The Figure of Daedalus

> What I want to find is another Ariadne's thread…to follow how Daedalus folds, weaves, plots, contrives, finds solutions where none are visible, using any expedient at hand, in the cracks and gaps of ordinary routines, swapping properties among the inert, animal, symbolic, concrete, and human materials.
>
> *– Bruno Latour, Pandora's Hope* [1]

The aim of this study is to present an alternative vision of organizational creativity, by examining the hidden nature of technique and its role within the production of new things. I would like to begin, however, by first addressing the figure to which the title of this thesis refers – the figure of Daedalus in his workshop. As a mythical character who enjoys the "composite reputation of being a scientist, a craftsman, a poser as well as a solver of riddles…and [a] most practical of escapists" (McCord, 1955, p.6), Daedalus symbolizes the kind of technically engaged creativity which I wish to make clear in the following chapters. As I will refer to this figure throughout, some context into the life of Daedalus and his mythology will help orientate the study.

The arch-technologist of ancient Greece, Daedalus is perhaps best known as the architect of the labyrinth, a prison constructed to contain the Minotaur –a bestial offspring wrought upon King Minos of Crete as punishment from the Gods. Daedalus was responsible for designing the labyrinth, a structure so complex that even he himself struggled to exit safely, and from which Theseus was only later able

to do so with the help of Ariadne's thread. Daedalus is also known for his ill-fated attempt to flee the Minoan island of Crete with his son Icarus, having angered the King for his role in the Minotaur's creation. Unwilling remain a prisoner and devote his talents to the political whims of Minos, Daedalus designed wings fashioned from bird feathers and candle wax, and sought to escape with his son by taking flight. However, against his father's instructions, Icarus flew too close to the sun, melting the wax holding his wings together, and ultimately perished in the sea which now bears his name. Heartbroken, Daedalus fled from Crete to Sicily, where he lay undetected. Minos however, devised a trap which would lead Daedalus to expose himself. Minos set the challenge of passing a thread around the inner curvatures of a snail's shell, a task which Minos knew only Daedalus would have the technical ingenuity to solve. Under the request of his host Cocalus, and unaware the task had been set by Minos, Daedalus solved the puzzle by drilling a small hole in the shell and attaching the thread to ant, which was able to crawl through, mapping the shell's inner structure. Thus exposed, Minos called upon Cocalus to have Daedalus extradited. Minos' success was however, short lived. Daedalus, colluding with one of the king's daughters, was able to circumvent the hot water pipes within the royal palace, allowing boiling water to fall on the king and kill him whilst bathing, all as if by accident.

As these brief extracts show, the myth of Daedalus does not offer simple narratives in which creative inspiration is championed as the solution to life's problems. Instead, we find something less straightforward: the workaround, ruse, machination, the technical fix which critically alters the balance of forces at play. The story of Daedalus then is not, as Bruno Latour notes, a story "in which the courageous

innovator breaks away from the constraints of social order" (1999b, p.192) but rather an invitation to consider *technique*, to consider the artifice of everyday life made possible through technical objects. In the course of this study, it is the question of technique, and the emergence of ideas in their practical, technical settings -so often overshadowed by the celebration of great thinkers and great ideas – which will take the focus.

Entering the world of technique however, can quickly lead to many different directions and pose questions for which answers may not be readily available. In the face of these circuitous, labyrinthine paths, the figure of Daedalus in his workshop can act as a guiding image to accompany the arguments developed in this study. As Bruno Latour notes, in the myth of Daedalus "all things deviate from the straight line" (1994a, p.29) of reason, and must instead pass through the mediations of technical action. It is therefore appropriate that the image of Daedalus in his workshop should act as an "eponym for technique" (1994a, p.30). Latour himself proposes that the figure of Daedalus, coupled with his ingenious artefacts (*Daedalia*)[2] may be "our best tool to penetrate the evolution of civilization" (p.30). Whilst my own aims are considerably less expansive than Latour's, I do believe the eponym holds value for the present study.

Interestingly, the suggestion of a guiding figure for technical activity is not without precedent in the field of organization studies. Stephen Barley, in his (1996) plea for a better understanding of the increasingly technical nature of modern work, proposed that the image of the technician could act as an 'ideal type' with which to explore emerging forms of organizing. Aimed at capturing a new occupational category brought about by economic and technical expansion in the post-war period, Barley's

technician sought to describe the elements which conveyed the technical nature of organizational life. Barley was particularly interested in the 'empirical interface' navigated by the technician, described as "a point at which a production system met the vagaries of the material world" (p.418). In Barley's view, the ideal type of the technician was a figure who stood "with one foot in the material world and the other in a world of representations" (p.418). Like Barley's technician, the figure of Daedalus in his workshop also presupposes a point in-between the individual actor and their technical environment, in-between designations of subject/object, mind/body and natural/artificial.

Finally, the figure of Daedalus in his workshop invokes a different type of knowledge which is generated and utilised in practice. As Latour argues, the artifice of Daedalus does not emerge from *episteme* – from the abstraction of knowledge by a purposive subject about the underlying nature of the world, but from *polymetis* – the allying of different agencies in the service of action. This *metis*[3] -or cunning intelligence- employed by Daedalus captures a distributed form of engagement that emerges when we cannot rely on clear reason or brute force to overcome the obstacles presented by everyday life (Anagnostopoulos and Chelidoni, 2008). Instead, the path of metis is one paved by ingenuity and craftiness, a manoeuvre which "puts us on notice that giving oneself over to the twists and turns of events will involve us in beguiling and furtive actions alike" (Chia and Holt, 2009, p.200). For Latour, this path of action necessarily involves a detour through technical objects and their attendant techniques (Latour, 2002) recognising that for a particular ruse or machination (-*metis*) to succeed, it must ally itself with different forces (*poly*-). The concept of *metis* has also been noted in organizational studies as a "form of

resistance to measurement and control systems" (MacKay, Zundel and Alkirwi, 2014, p.420), as well as involving "a partial abandonment of control… not assuming oneself to be the agent of every solution, or the cause of each decision" (Letiche and Statler, 2005, p.5).

In this study, I shall deploy the image of Daedalus in his workshop to help understand the nature of technique and how it contributes toward creative practice. Specifically, I shall utilize the concepts of *polymetis* (Latour, 1994a; Chia and Holt, 2009), Daedalia –technical objects (Latour, 1994a)- and the image of the Labyrinth (Wood, 2002; Kociatkiewicz and Kostera, 2015) to develop the image further and address the questions this study seeks to answer.

1. IN DAEDALUS' WORKSHOP

Introduction

Peter, the Atlas technical manager, sits bent over the digital sewing machine which, thanks to the arrival of new software, is momentarily the centre of attention. Having installed the new program, he finds the machinery is now jamming continuously and struggling to produce the designs displayed on the adjacent screen. Peter dons a headset complete with torch and magnifying glass, removes the outer casing, and begins to examine the threads wrapped around the loading bobbin with a small blade:

> ***Rory:*** *"How did you learn how to fix things?"* I ask, as Peter begins to identify the problem area.
>
> ***Peter:*** *"By opening up the side and poking a needle into it."* Peter replies, *"It's pretty much the way."*

Peter continues to probe the loading mechanism, attempting to disentangle the many threads hampering the smooth running of the machine. He points to a particular area which he suspects is responsible for the odd noises and poor quality, and questions the other studio designers who had been using it recently, as the foremost problem with machines is often people. Unsurprised by the answer he receives, Peter then directs his inquiry to the machine itself:

> ***Peter:*** *"That old software was bad for that, not being intelligent, it just kept on doing new stuff on top of the old stuff… can you see this pile?"* he asks, pointing to a mass of thread, *"There's so much stuff wrapped around these."*

The other designers question the need for Peter's headgear, which he insists is necessary for the light. Undeterred, Peter begins to make progress with the tangled threads:

Peter: *"I do like a mechanical fix."* he says, pulling small masses of thread from the sewing machine, *"Something that can be tightened or loosened or cleaned or whatever* [Peter turns back to the machine] - *the threads do snap quite a lot."*

Peter moves from the initial issue with the loading bobbin to examine the under stitching mechanism. Lifting the fabric reveals the more complicated problem of incomplete stitches, and further blockages of torn thread. As he works, I ask him if he enjoys this sort of thing, and how he first became attracted it:

Peter: *"I've always been interested in machines and making things work."* he responds. *"My dad was very into DIY and stuff like that, he was always fixing things or making things."*

Rory: *"In the shed?"* I ask, recalling Peter's mention of his father in an earlier conversation.

Peter: *"Yeah."* he replies, *"Or in the house, even when I was studying architecture, a lot of people there who you'd think would be similarly minded didn't even know how to hold a drill… you'd think doing architecture everyone would be making things or sculptures or structures or models or whatever, but some people had no understanding - a lot of very intelligent people - but it's just not a skill that they have. Equally in here* (The Atlas studio and its clients) *there's loads of people that come in and you see that they have - they're very very intelligent in their field - but they've no idea how a screwdriver works, no idea how to turn a spanner; and that's something we took for granted that people would know, an equally important skill to learn with the digital tech that we're using - to apply manual processes to make it work."*

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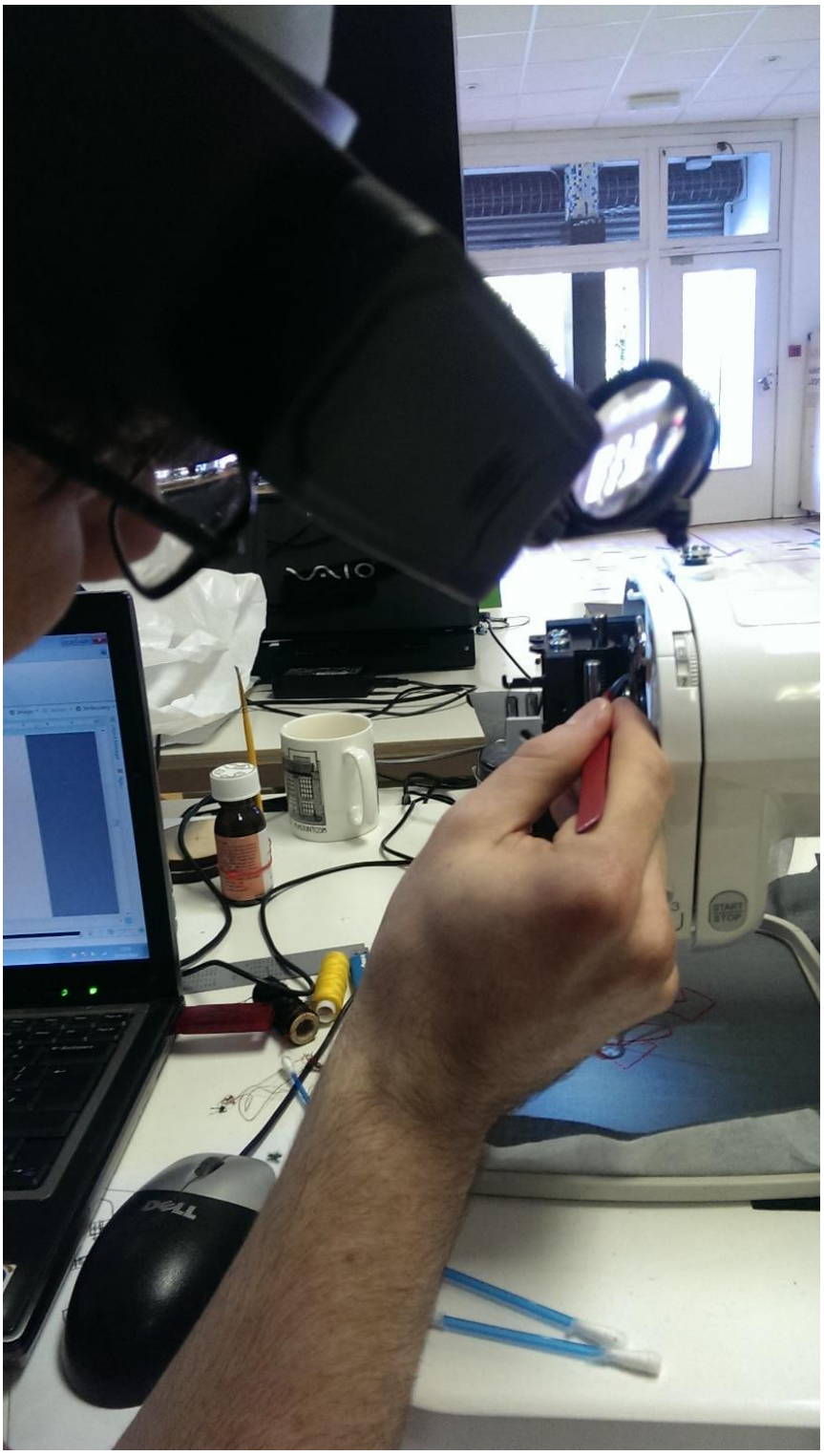

Figure 1: Peter fixing the broken machine

The image of the technician attempting to fix his machine, of Daedalus in his workshop, surrounded by his tools and scattered bits of thread, has not often found a fitting expression within organizational theory. There are likely a number of different reasons for this omission, stretching well beyond the scope of the present study, which is focused upon one particular question: *How can technique be understood as contributing toward creative practice?* An answer, I will argue, can be found by drawing upon a process perspective to uncover hidden nature of technique, and its role within the production of new things.

Technical issues, such as the one described above, occur in the imprecise, blurry zones of action where differences between representations of the material world and the material world itself are momentarily brought into focus, and brought to bear upon one another (Barley, 1996). In such moments, it is not always possible to predict the effects of different connections formed between organizational actors, technical objects, and the techniques which draw them together –connections which render the intricate technicity of organizational life visible, directing us toward the processes from which novelty emerges.

Such moments of focus are however fleeting. No sooner than the technical issue is resolved does technique find itself relegated to the background, hidden amongst the competing areas of discourse, intelligence, science, psychology, mechanics and economics, which overtake technical issues to dictate descriptions of everyday production (Stiegler, 1998). Whilst each of these areas (and many others) lay claim to parts of technical action, capturing, for example, the financial pressures on the task at hand, the sense-making processes of talk between different actors (Orr, 1996), or the knowledge displayed in the application of explicit and implicit know-how

(Nonaka, 1994), they nevertheless also obscure the battleground of different forces that constitutes technical action itself.

In contrast to dividing up technical action into these different disciplines, my aim is to recover it. Coupling technique with a process perspective affords the opportunity to reconnect the different forces present within the labyrinthine paths of technical action. I argue that this line of inquiry may help advance our understanding of the processes of organizing, our understanding of creativity, and help deal with the challenges of design. Furthermore, this line of inquiry offers fresh perspective on the inventive processes which give rise to creative and novel outcomes within organizations.

Recalling Technique

First of all, it must be noted that 'technique', the word which I believe most readily captures the kind of technical activity described in the scene above, is something of a curiosity within studies of organization. As a term that regularly appears within the fields of practice and technology at work (Barley, 1996; Orr, 1996; Schatzki et al., 2001; Orlikowski, 2002; Leonardi and Barley, 2010), technique is rarely elaborated or critically applied. This lack of elaboration stands in contrast to the related terms of practice and technology themselves, the latter being routinely employed as a shorthand for objects, processes, activities and knowledge[1] (Bijker et al., 1987). The breadth afforded to the term 'technology' can however, lead to unwanted consequences. François Sigaut, referring to a previous attempt to collate the different definitions of technology which amounted to over 600 items, warned that should this trend continue, scholars would soon have to add "an increasing number of whole papers, not to

mention books, with much the same disappointing results" (1985, p.115) in pursuit of clarifying the overburdened term.

Likewise, the historian Leo Marx has argued that despite technology's relatively late arrival into popular usage (Schatzberg, 2006), its popularity, generality and lack of specificity have lent the term technology a 'phantom objectivity'[2] which may be hazardous to our understanding of its social, moral and political dimensions. Such is the analytical difficulty in maintaining the different meanings of technology that some organizational authors have even chosen to oscillate between a precise definition and common usage within a single text (Orlikowski, 2008). And yet, within such broad definitions, debates still continue on how best to understand the connections being made between the social, technical and material aspects of practical activity within organizations (Orlikowski, 2008; Orlikowski and Scott, 2015; Czarniawska, 2017). It is therefore striking that 'technique', a concept which already seems to presuppose a space to explore such connections, remains ill-defined and unappreciated.

What are the reasons for this neglect? The first is the view that technique refers to an outmoded, pre-industrial form of production. This position is well described by Ergon Bittner, who argued that science has effectively synthesized "the earlier *bricolage* of diverse techniques into an independent, internally coherent well-ordered body of principles" (Bittner, 1983, p.253). This process of abstracting knowledge from techniques has proceeded apace since the onset of the industrial revolution (Taylor, 2012), with dramatic consequences for what Bittner describes as "the conduct of life" (1983, p.249), placed under threat from this encroaching advancement. Commenting on Bittner's work, Julian Orr suggests that, much like proponents of the deskilling effects of modern technology in the workplace

(Braverman, 1974), Bittner's view seems to indicate that the role of technique has been decisively (and too readily) "excised from practice" (2006, p.1810) by the application of scientific principles to the processes of production.

This view, whilst at first convincing, overlooks the fact that the application of scientific principles to the real world often requires the expertise of the technician, posing the more complex question as to "what counts as genuine knowledge as opposed to mere skill" (Shapin, 1989, p.562). Bittner may also be at risk of presenting an idealised image of how science is made, as authors in the fields of science and technology studies (STS) and the sociology of scientific knowledge (SSK) have gone to great lengths to show (Latour and Woolgar, 1979; Knorr-Cetina, 1992). Indeed, it has been argued convincingly by STS/SSK authors that far from the application of abstract principles, modern science practice involves political, natural, discursive, scientific and cultural forces (Latour, 1987).

The second reason driving this general neglect is the related misconception that if technique is subordinate to abstract principles, then it is only intelligible in relation to them. In this case, technique is reduced to a "how-to" guide or the simple application of a schema, divorcing it from its practical expression. Take for example, the image (fig.2) of the steps to a waltz as described in Albert W. Newman's (1914) *Dances of To-day*, in which the technique of waltzing has been abstracted to a series of repeatable positions.Whilst this is clearly very useful for someone wishing to learn to dance, it does not necessarily capture the technique of waltzing in its entirety. The danger with this line of thinking, which separates *a priori* knowledge about a technical activity (creating a *logos* for *tekhne*, or techno-logy) from the assumedly

lesser knowledge or skill utilised in its practical application (technique), can be found in some surprising locations.

Bijker et al. (1987), for example, who despite recognising the "heavy interpretive load" (p.3) of terms such as technological development and change, do not develop the "useful distinction between "technology" and "technique" or "technics" into English usage" (p.6). The difference between these terms, they suggest, is "analogous to the distinction between "epistemology" and "knowledge"" (p.6). Whilst this distinction on the authors' part may simply serve to clear the path for their preferred term of *sociotechnical systems*, it nonetheless relegates technique in a manner which seems out of step with some of their own commitments. Like any plan or map, diagrams that relate to action (techniques included), only ever capture certain aspects of lived experience; an experience which is irreducible to a purely representational form (Suchman, 2007). The risk, as noted by theorists of organizational aesthetics, is that such accounts are "purged of corporeality" (Strati, 1999, p.3), offering a narrow, reductionist vision of how action unfolds.

Emerging as a consequence of the previous two issues, a third concern is that techniques themselves, lacking a specific *logos*, are not able to provide an explanation and can therefore be referred to in an arbitrary manner. Considered as implicit within studies of organization, it appears that because techniques may refer to so many different kinds of technical activity, that the concept of technique possesses no explanatory power in itself.

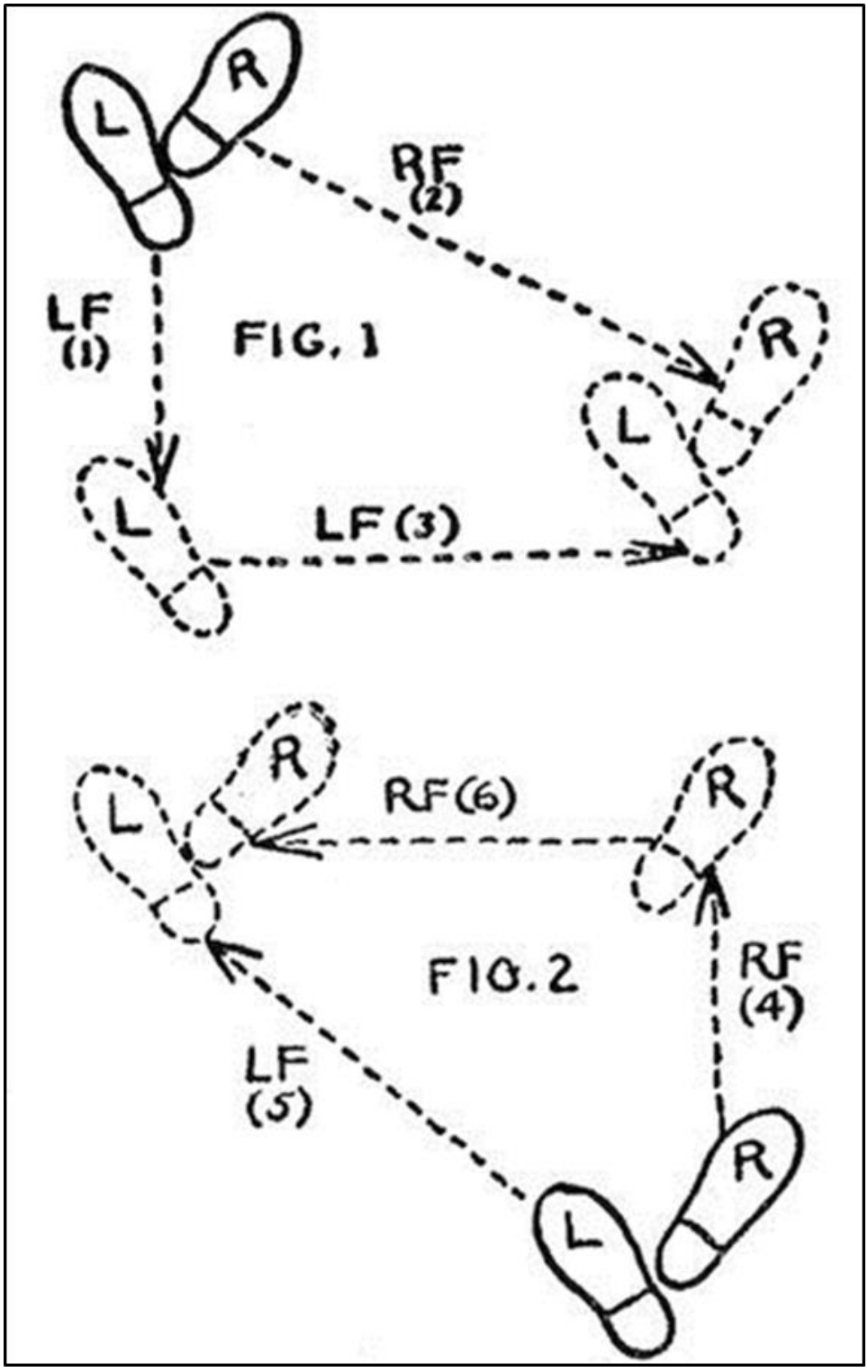

Figure 2: A standard waltz (Newman, 1914)

There may be a technique for this or that; a technique for cooking a particular dish, a technique for carving a shape out of wood, a technique for motivating a team, or for organizing data for a client. However, there is no field of study which connects these disparate practices as *techniques*, and, by proxy, no agreed form of analysis by which to examine them.

On this point, the historian Bertrand Gille notes that technique and the knowledge it generates are therefore often "willingly cast aside as empiricism…for empiricism here means an absence of logic, and all knowledge, as such, is necessarily logical." (1986, p.1137). Thus, in studies of organization, one can speak of the critical incident technique, The Delphi technique, the techniques of psychoanalysis, without ever determining why they should be labelled techniques. Explanation is deferred to the specificity of the fields which lay claim to the knowledge generated from such activities. These reasons may provide some explanation for the neglect of technique. Yet, when the above image of the technician is considered, the question must be asked if such reasons, which appear counter-intuitive to the recent direction of both studies of practice and technology, should be maintained. To address this issue, I now turn to the area of organization studies that this study will offer a contribution to, and which I believe holds the greatest opportunity for the study of technique.

Process Philosophy and Organization Studies

As the previous section has shown, technique has been too readily overlooked, partly due to a misunderstanding of its relation to science and technological development (Bittner, 1983) and also in part to the epistemic difficulties associated with technical knowledge (Gille, 1986). These difficulties are amplified when dealing with the

emergence of the new (Deleuze and Guattari, 2004) and also point to a potentially larger issue. Whilst reference to technique is common enough, even a cursory examination reveals tensions between theory and practice, subject and object, and what type of knowledge can best capture its operations. Might it therefore be that technique, like the novel outcomes it begets, is less static than commonly assumed? To address these issues, the current study adopts a philosophical outlook sensitive to such possibilities. It will draw upon process organization studies, the area identified as providing the appropriate philosophical perspective required to address the question of technique in creative practice and the generation of new things.

Process organization studies (Hernes and Maitlis, 2010) reject a substantialist outlook in favour of a worldview emphasising movement, heterogeneity and change (Tsoukas and Chia, 2002; Cooper, 2007; Langley, Smallman, Tsoukas and Van de Ven, 2013; Helin, Hernes, Hjorth and Holt, 2014). In doing so, these studies draw on a range of different perspectives and theoretical traditions sensitive to the dynamics of change and its relation to the assumed solidity of people, institutions and things. In asking such fundamental questions, process studies also provide fertile ground to consider the possibilities of alternative modes of inquiry and representation (Nayak, 2008; Chia and Holt, 2009; Lorino, Tricard and Clot, 2011).

The inspiration behind process organization studies can be traced back to the pre-Socratic works of Heraclitus (Rescher,1996), though is most often associated with the philosophies of Alfred North Whitehead, Henri Bergson and the American Pragmatist tradition (Chia, 2002; Bakken and Hernes, 2006; Hernes, 2008; Elkjaer and Simpson, 2011). Gaining prominence at the turn of the twentieth century, these thinkers drew on concurrent developments in biology, physics and social affairs to

develop radically different philosophical perspectives. Whilst there are of course a number philosophers who have championed a process perspective, for the purpose of this introduction to the study, I shall limit discussion to the three named above.

Alfred North Whitehead, the philosopher most frequently associated with the field, developed a process-relational philosophy centred on the importance of the event (Rescher, 1996; Cobb, 2007). In arriving at this view, Whitehead's approach presented a decisive break from the positivist orthodoxy of his day by rejecting what he described as the "bifurcation of nature". This bifurcation, Whitehead argued, was the result of a misplaced tendency to treat the mind (subjective experience) as different in kind and separate from the (objective) world, and the laws which govern it. Tor Hernes describes this tendency (often found within positivist research) as the belief in "a world 'out there' that operates by certain sets of laws, and a mental world 'in here' operating by a different set of laws" (2014a, p.258). Whitehead dismissed this view, which he considered the result of a "misplaced concreteness" in treating an abstraction (the separation of mind and matter) developed for its explanatory power as directly accounting for reality, despite the challenge presented by experience. Whitehead argued instead for the importance of experience and its interrelation to both physical and biological processes, offering what Rescher describes as a "prismatic" (1996, p.22) view of reality.

This prismatic view opened up the possibility to consider the complex ways in which the different things which make up the world are affected by one another, and justifying his decision to make the event, rather than substance, the primary unit of analysis. Events, Whitehead suggested, are not discrete occurrences building atop of one another, but a manifold connection of "precedents, contemporaries and

antecedents" (Hernes, 2014b, p.95). Whitehead utilized the concept of "prehension": a term used to denote the "way in which what was there-then, becomes here-now" (Cobb, 2007, p.570) to explain how events are both formed of and serve as the basis for future formations. A critical aspect of Whitehead's process philosophy, who coined the term creativity (Hernes, 2014b), was the essential novelty to be found in the different relations these new events give rise to. Whitehead drew upon the *clinamen*, a term borrowed from Lucretius to denote the unpredictable swerve of atoms passing through the void, to capture this same sense of unpredictability. In Whitehead's philosophy the unfolding of events possess this quality and capability for unpredictability, culminating in a concrescence or 'creative advance' toward novelty (Whitehead, 1929; Chia and King, 1998).

The second touchstone for process organization studies is the philosophy of Herni Bergson (Linstead, 2014; Nayak and Chia, 2011; Wood, 2002). In a similar vein to Whitehead's concept of misplaced concreteness, Bergson's work is both a resource for thinking in terms of process, but also *how* to think: to consider how problems are formed and stated, assess their value in the face of experience, and reaffirm the importance of metaphysical inquiry to "*apply the test of true and false to problems themselves"* (Deleuze, 1991, p.15, emphasis in original). One example of this sensitivity can be found in Bergson's early work *Time and Free Will*, in which he introduced the concept of duration (*durée*) as a point of distinction from the treatment of time as a mechanical construct. Whereas we are familiar with time as divisible into seconds, minutes and hours, we are also "conscious of and experience time as *duration* –a constant flowing process, with no ends or beginnings" (Linstead, 2002, p.101), upon which Bergson centred his attention. The treatment of time as a

measurable, mechanical, discrete *t*, Bergson argued, was the result of conflation of time and space (or a spatializing of time to render it calculable), further ingrained by both language and representation –of which Bergson was always sceptical (Linstead, 2014).

Bergson argued that in thinking of time as duration, we are able to account for its novelty and heterogeneity, in contrast to the spatialized image of time which is homogenous and discrete. Bergson conceived of two different types of multiplicity – quantitative and qualitative– to explain the differences between these two treatments of time. Though both offer a description of reality, their outcomes are radically different, as shown in Linstead's (2014) example:

> A moment of duration can be tasted in the qualitative difference between a clock minute spent in a poolside lounger; a minute driving a car in a competitive race; a minute searching for painkillers when you have a migraine…or a minute watching your first child being born. None of these is experientially comparable: if you were doing one of them you would not mistake that feeling for any of the others, such is their qualitative difference though quantitatively identical (p.222).

The desire to account for *becoming* (Tsoukas and Chia, 2002) as a means to reaffirm the inherent novelty, freedom and indeterminacy of reality can also be found in Bergson's *Creative Evolution*. Here Bergson expanded the concept of duration beyond the experience of consciousness proposed in *Time and Free Will* (Guerlac, 2015) and drew upon biology to present a creative view of how life emerges in opposition to two prominent views describing evolution: radical mechanism and finalism.[3] In his critique of mechanism (a critique also readily applied to mechanistic accounts of technique) Bergson argued that if adaptation were purely dictated by

mechanical forces governing the universe, then a superior intellect could conceivably predict all future forms or developments that would occur (a view which had been proposed by Bergson's contemporaries Laplace, Du Bois-Reymond and Huxley). Such a view however, which did not exactly stand up to empirical scrutiny, also left no room for unforeseen novelty. In finalism Bergson found a similar problem, only this time it is the assumption that evolution is the realisation of a plan set in motion, a radical *telos* which assumes there is such a thing as a final form or state to be reached. Both positions, Bergson believed, disregarded duration (without which everything would be given at once), and in doing so ignored the ways in which life advances creatively: "*Wherever anything lives, there is, open somewhere, a register in which time is being inscribed*" (1907/1944, p.20, emphasis in original) and which permit the possibility of novelty. Whilst aspects mechanism and finalism are not denied in Bergson's philosophy,[4] the key difference is the introduction of the force of life in time itself –the *élan vital*– a movement which is "absolutely positive, not needing to be determined, mechanically, teleologically or dialectally; its cause is its efficient force of internal differentiation" (Scott, 2010, p.98-9). In this way, Bergson provided a processual philosophy of life as a continuous unfolding, swelling differentiation in time.

The final group of thinkers connected to process organization studies are the American Pragmatists. Emerging from critical dialogue with the philosophies of Hegel and Kant (as well as being early advocates of the philosophies of Bergson), the pragmatists influenced the study of semiotics, psychology, phenomenology, politics, education, art and sociology (Joas, 1993; Simpson, 2009). Pragmatism did not develop with the aim of producing a single school of thought, and is therefore not

centred on an agreed definition or set of aims. A common starting point can, however, be found in the insistence that philosophy and the construction of knowledge be grounded in practical experience, as exhibited by Charles Sanders Peirce's Pragmatist maxim:

> Consider what effects, which might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of these effects is the whole of our conception of the object. (1878/1982, p.88)

The focus on effects in practice, rather than admission to any pre-existing law, lies at the heart of the pragmatist movement, and captures the same outlook toward novelty and inherent change of reality found in Whitehead and Bergson. As Bernstein argues, one aim of pragmatist thought was to shift the emphasis of human inquiry away from the "spectator" who looks for deeper understanding on the basis of unchanging laws toward "an active participant and experimenter" (1971, p.177) dealing with the contingencies of change. There is, then, a sense of anti-foundationalism within pragmatism (Simpson, 2018), which bears much similarity to the anti-intellectualism in Bergson and Whitehead's appeal to the importance of experience.

Peirce's insistence on the importance of situated inquiry, of the "notion of a COMMUNITY without definite limits" (Peirce, 5.311, as cited in Bernstein 1971, p.176, emphasis in original) around which knowledge is produced, was underpinned by his own unique ontology of signs. Peirce conceived the sign as a central component to understanding reality, and rather than fixed to objects, saw their movement as a process of *semiosis*, with signs continually being generated in "long teleological chains deployed over time in a certain direction…the arrow of meaning moving across time, space and society" (Lorino, 2014, p.143).

For Peirce, this ‘arrow of meaning’ cut across dualisms of mind and body, individual and society. It resulted in a number of philosophical innovations, such as his triadic theory of meaning, in which an interpretant (in conjunction with the object and sign) was introduced to expand the dyadic (and immediate) relation of signifier and signified (Hoopes, 1991). This sense of processual unfolding over time is also witnessed in the work of William James, who quickly recognised the value of Peirce’s insights. Best known for his contributions to psychology, James’ pragmatism provided insight into daily life, opposing the strict scientific conditions being imposed on the fledging discipline of psychological study with a functionalism based on the richness of everyday experience. The result of such inquiries was a variety of concepts and interpretations of experience which now find themselves ingrained in modern language, the best known of which is James’ description of the ‘stream of consciousness’:

> Consciousness...does not appear to itself chopped up in bits. Such words as ‘chain’ or ‘train’ do not describe it fitly as it presents itself in the first instance. It is nothing jointed; it flows. A ‘river’ or a ‘stream’ are the metaphors by which it is most naturally described. In talking of it hereafter, let us call it the stream of thought, of consciousness, or of subjective life. (James, 1890, p.239 as cited in Powell, 2014, p.173)

This processual understanding of everyday experience either through the movement of signs or the unfolding of consciousness breathed new life into aspects of living which previously had not been considered worthy of inquiry. We find for example, in the works of John Dewey (along with the aforementioned authors) a rethinking of the importance of habit, reformed as “a special sensitiveness or accessibility to certain classes of stimuli, standing predilections and aversions, rather than bare recurrence of

specific acts' (Dewey, 1983, p.32, as cited in Vo and Kelemen, 2014, p.238). Likewise for George Herbert Mead, concepts of temporality and inter-subjectivity are joined to describe a form of *sociality* (Simpson, 2014; Simpson, Tracey and Weston, 2018) to explain how selves engage in an ongoing process of becoming. Drawing much from Bergson's studies into the nature of time and consciousness, Mead offered an alternative conception of lived experience, in which past and future were not fixed but instead treated as "epistemological resources that are continuously reconstructed to inform the actions of the passing present" (Simpson, 2014, p.276).

Building upon the legacies of these thinkers (and many others), process organization studies present a challenge to the implicit philosophical assumptions which generally underpin organization theory (Langley and Tsoukas, 2010). Such assumptions, process scholars argue, tend to materialise in "an intellectual attitude which treats entities, states and events as primary, whilst processes, relations and interactions are deemed to be epiphenomena of these underlying realities" (Chia, 1996, p.35). This intellectual attitude, which is both prevalent and often unchecked in organizational literature, is challenged on two fronts. First, a process worldview highlights that organization theory, whether scholars choose to explicitly recognise it or not, necessarily involves making certain philosophical assumptions about the object of study (Chia, 1996). Philosophy should, however, not be treated as something additional to theory building, as theory building itself relies upon an "unconscious metaphysics" (Tsoukas and Chia, 2011, p.6) which Burrell and Morgan (1979) suggest must be made clear .

Exposing these philosophical assumptions leads to the second challenge: how are such assumptions are reached, and what can be gained from exploring alternatives?

Rejecting substantialist worldviews in favour of examining process is one possible option among many, and has already proved productive in analyses of areas such as language and communication (Shotter, 2008; Taylor, 2014), identity formation (Simpson and Carroll, 2008; Gioia and Patvardhan, 2012), materiality (Orlikowski and Scott, 2013) temporality (Linstead and Mullarkey, 2003; Hernes, 2014a; Guerlac, 2015) and the emergence of novelty (Chia and King, 1998; Garud, Simpson, Langley and Tsoukas, 2015).

The difference between a process and substantialist worldview can be further explained by examining how the two differ in practice. Take the organization, a primary unit of analysis in its namesake *organization studies*. From the substantialist worldview, organizations tend to be treated as fixed entities located within an external environment. It is commonplace, for example, to speak of an organization in the same way one would speak of a physical structure: organization A is organization A because it different from organization B, and is temporally and spatially distinct in the same way Paris is from London.

From this point of view, organizations A and B are both subject to what Robert Chia describes as a principle of 'simple location' (1998), as discrete objects that interact with other objects in a causal manner. Analysis can then proceed in comparing one organization to another, or in respect of external factors which may have a positive or negative effect on their functioning. The underlying assumption here, as originally identified by Burrell and Morgan, is that "theories of organization are based upon a philosophy of science and a theory of society" (1979, p.xii) and can be explained using the same analytical tools. Look again from a process worldview however, and this view may not be as straightforward as it first appears. Beneath the frontispiece of

organization A or organization B, lies a shifting web of people, things, resources and values, all driven forward by everyday acts of organizing (Czarniawska, 2008), which in their own way also form the 'the organization'. Indeed, without such actions, the entity commonly referred to as 'the organization' may cease to exist in any meaningful sense, or is rather the effect of such actions rather than their cause. As Karl Weick, an early advocate of process thinking argued:

> The word, organization, is a noun and is also a myth. If one looks for an organization one will not find it. What will be found is that there are events, linked together…and these sequences, their pathways, their timing, are the forms we erroneously make into substances when we talk about an organization (1974, p.358)

From a process perspective, one may legitimately ask whether treating organization A or organization B as a discrete entity ultimately acts as an obstacle to understanding the processes of organizing that underlie it (Cooper, 1986; Chia, 1999; Czarniawska, 2013). In place of these entities, process studies foreground the different connections found in between the different aspects which make up the organization. As Weick's statement above highlights, where one expects to find an organization, one may actually find a connected series of events, decisions, mechanisms and meanings continually developing over time. The structure or stability of the organization then emerges from the repetition or patterning of these occurrences (Langley and Tsoukas, 2010) and is reliant on their continued reiteration for its stability and maintenance (Hernes, 2008). As such, process perspectives add a much-needed temporal focus to organizational analysis, as well as opening up possibilities for exploring how novelty emerges.

Now well established within organization theory, a process perspective holds significant value for the aim of understanding the ways in which techniques can contribute toward creative practice. First, as techniques are fundamentally concerned with action, activity, performance and practice, they will naturally benefit from a process perspective. Contrastingly, a substantialist outlook, which would seek to reify or categorise techniques together with their operational requirements, will only take investigation so far, and may in fact be responsible for some of the misunderstandings noted earlier. Second, a process perspective, in its willingness to consider the "unconscious metaphysics" (Tsoukas and Chia, 2011, p.6) of organizational research may offer the appropriate resources for accounting for the type of knowledge generated by technique, which I have already alluded to in the prologue. Third, the importance of events offers an inclusive frame which considers whatever is involved, including affects, experiences, objects, tools, materials and many other things excluded from rational or logical descriptions of practice (Shotter, 2013). Fourth and finally, as displayed by the philosophies of Whitehead, Bergson and the American Pragmatists, the field of process organization studies is one in which questions of creativity and the emergence of novelty hold key importance, and this is where a consideration of technique can contribute.

Technique and Process: A critical question for Creativity?

By drawing on a process perspective to consider how technique contributes toward creative practice, this study aims to present an alternative account of organizational creativity. Taking Daedalus in his workshop as an eponym for technique, this work aims to problematize and take the emphasis *away* from another figure: The

individual creator. As I shall argue in the proceeding chapters, the figure of Daedalus and a processual understanding of technique offers a counterpoint to two notions prevalent in the literature. The first notion, commonly found within studies of organizational creativity, is that the creative process amounts to successful idea generation, and that production entails the mere execution of preconceived ideas, or that such execution is a separate process described as *innovation* (Anderson, Potocnik and Zhou, 2014). This view, as may already be apparent, leaves no room for considering how techniques inform creative practice, and also cuts off consideration of the kind of creativity emerging from different sorts of connections imagined by the process philosophers noted previously.

The second, more pervasive notion, is that the material world is something (in its chaotic or passive forms) to be tamed and overcome. This is the modernist doctrine of instrumentality (Arendt, 1998; Latour 2002), which, at the hands of the creative individual "implies a degradation of all things into means, their loss of intrinsic and independent value" (Arendt, 1998, p.156). In the image of the creative individual there is not only an anthropocentric depiction of creativity as a predominantly psychological phenomenon, but also an aggression or desire to rein the forces of the material world under control, under the auspices of progress and development. In contrast to this image, the eponym of Daedalus in his workshop points to a world in which the different forces of production must be engaged with, worked alongside in order to help achieve the desired outcome. In order to realise this view of creativity, it will be necessary to consider it from the critical perspective of technique, and, coupled with a process outlook, consider the ways in which it can be productively reimagined.

Outline of the Thesis

To answer the question of how technique contributes toward creative practice, this study has been ordered thematically, combining literature, fieldwork and theoretical interpretation to problematize existing organizational perspectives and help generate new ones (Alvesson and Kärreman, 2007; Alvesson and Sandberg, 2011). Chapter two presents the methodological arguments which inform the study. Building upon a process perspective and arguments developed within Science and Technology Studies (STS), I raise the question of multiplicity (Mol, 1999; Law, 2004), its relation to method and its relevance to the research aims. Following this, I present an 'experimental' methodology, utilising a series of ethnographic methods (observation, field notes, interviews, images and artefacts) which, when taken together, can help offer insight into the ways in which technique contributes toward creative practice. The chapter continues with a description of the research sites, and a rationale for choosing design-led organizations. To conclude, the chapter provides an outline of the research process, challenges, a discussion on reflexivity and a summary of the main points developed.

Chapter three begins by considering the connections between technique and process studies of organization (Hernes and Maitlis, 2010). To do so, I present a review of works from the fields of anthropology, philosophy and sociology that offer important insights into technique. Following this, I consider works within the field of process studies that offer complimentary resources for its study within organizations. Having laid this groundwork, I then focus on three dimensions of technique with reference to the empirical material gathered from the fieldwork. I begin with an analysis of the

different agencies found within technique. Identifying these leads me to consider the manner in which these agencies are joined together and decoupled as techniques develop, via the processes of association and substitution. Finally, I examine the artifice displayed within the enrolment of techniques into broader programs of action. I argue that these three areas highlight the distributed, technical character of organizational life, and the importance techniques hold for its ongoing production and maintenance.

An elaboration of technique leads to a critical appraisal of the field of organizational creativity in chapter four, which has often undervalued the technical processes of creating in favour of an analysis of the creative individual. Tracing the roots of this disjunction to the classical degradation of the craftsman's practical arts, I argue that the study of creativity has historically neglected both technical objects and the attendant *tekhne* of production, instead emphasising thought and reflection. This disjunction results in difficulties for the present study of organizational creativity, which must account for (and in some cases rely upon) technical outputs as both the means and ends of creative action, without a clear understanding of how they are related to the process itself. I begin with a review of the organizational literature, considering both psychological and social approaches (Amabile, 1996; Perry Smith and Shalley, 2008) and the important critiques and contributions offered by process orientated scholars (Chia and King, 1998; Hjorth, 2005, 2013). To further develop an understanding of these issues, I highlight three areas of critique, and through an examination of empirical material consider the issues of excluded objects, the assumed direction of the creative process, and the underlying vision of novelty which informs studies of organizational creativity.

Having clarified the limitations within the organizational creativity literature and the value of process approaches, I then turn in chapter five to consider how technique can be addressed to better understand the generation of creative outcomes within organizations. In response to this challenge, I argue that affirmative answers already lie within the theory and practice of design. Through an appreciation of the form and content of its own process and outputs, theories of design move away from the image of an individual creator who preconceives forms in advance of their technical implementation. Instead, theories of design offer the means to consider the creative process in terms of how signs, things, actions and thoughts join together (Buchanan, 1992). I begin with a critical review of the scientific origins of the concept. Following this, I then present theories of design which align themselves with a process perspective. These include theories of design centred on praxis, and theories which can be used to consider the relationship between design and the dimensions of technique. In order to explore the potential this perspective holds for understanding the generation of new forms, I examine three design techniques commonly utilised within the two empirical sites, namely design thinking, prototyping and structured improvisation, to highlight the value a design perspective may hold for developing new ways to engage with the creative process within organization theory.

Drawing these different aspects together, I present in chapter six a series of guiding concepts for process organization studies. What I have termed the 'dynamics of invention' aims to offer an alternative perspective or rough guide to the generation of creative outcomes, by engaging with the different modes of technical activity expressed through the concepts of technique, creativity and design and inspired by a process perspective. I conclude with a return to the figure of Daedalus, and present

four contributions to the field of process studies. Firstly, I argue that this study provides an empirical consideration of the concept of technique, and its value for exposing the artificial nature of organizational life. Secondly, it extends an important dialogue in process organization studies on technical activity. Third, it offers a critique of the dominant perspectives within organizational creativity, which without a consideration of technical activity are likely to remain the preserve of the creative individual. Finally, it addresses the question of how technique contributes toward creative practice by presenting the dynamics of invention, a rough guide to how new things emerge via technical means.

Conclusion

To restate the central aim of the study: this thesis asks how technique can be understood as contributing toward creative practice, and seeks to provide an answer to this question by drawing on a process perspective to uncover the hidden nature of technique. At the outset of the chapter, I have indicated the reasons technique has been largely neglected in organization studies and elsewhere. Following this, I have presented a review of process organization studies and its underlying tenets: the area of organization studies which this study aims to contribute to. Finally, I have raised the critical possibilities offered by a process inspired reading of technique for organizational creativity, and laid out the direction each chapter will take. In the next chapter, I turn to consider the appropriate methodological outlook for exploring technique and creative practice.

2. INSIDE THE WORKSHOPS

Introduction

The previous chapter identified the question of how technique contributes toward creative practice, presenting process organization studies as a suitable philosophical and practical basis for the inquiry. From these initial explorations, however, it is clear that technique (and the opportunity for creative practice therein) is by no means an easy concept to pin down. Exemplified by the breadth of different meanings supposed by 'technology', the relative neglect of 'technique'; and a lack of clarity on what constitutes technical knowledge (Gille, 1986), attempts to describe technical activity become problematic when the relations, structures and materials caught up between people and things in the process of production require detailed consideration. Whilst it has been possible to identify technique as an area of study, it is nevertheless a challenge to determine exactly what should be researched empirically, and how. As Bruno Latour warned, we will have to be "as devious as the ant to which Daedalus attached his thread" (1994a, p.30), if we are to successfully handle both the theoretical and methodological challenges involved in capturing its operations.

To meet this challenge, the current chapter sets out the methodological arguments which inform the study, and the methods utilised to examine the research problem empirically. The chapter begins with a discussion on how to research the ways in which technique contributes toward creative practice. Considering arguments developed within process studies and Science and Technology Studies (STS), I raise the question of multiplicity (Deleuze, 1991; Mol, 1999; Law, 2004; Linstead and

Thanem, 2007), its relation to method, and its relevance to the research aims. Drawing upon an ethnographic-inspired approaches advocated by both STS and process-based organization studies, I present an 'experimental' methodology. This methodology utilises a series of ethnographic methods (observation, field notes, interviews, images and artefacts,) which, when taken together, can help offer insight into the ways in which technique contributes toward creative practice.

Having presented the methodological approach, a description of the organizational context in which the research has been undertaken is then provided. Design-led organizations, I argue, offer an appropriate site to examine the daily intricacies of techniques and technical choices which inform creative practice and ultimately lead to creative outcomes. In particular, design-led organizations offer a useful location to explore the processes that occur before the 'black-boxing' of technical matters (Callon and Latour, 1981). They also offer an explicit dialogue on working creatively (Wang and Ilhan, 2009). Having clarified how the research has been conducted, the chapter concludes with an outline of the research process, challenges, a discussion on reflexivity and a summary of the main points developed.

Technique, multiplicity and method: A process perspective

Whilst technique undoubtedly presents a challenge for inquiry, it is relevant to question to what extent these difficulties are in fact indicative of some conflictual character or feature inherent to its nature. Instead of eschewing such complications (and assume that technique merely points to something diffuse or vague), it is productive to embrace them, and examine the possibilities offered by exploring the fault lines along which this seemingly misunderstood concept of technique has been formed. One particularly rich body of literature to draw upon for this task is the onto-

epistemological argument advanced within process organization studies and STS. This position holds that the challenge in understanding technical (or organizational) processes is reflective of a greater complexity to be found within reality itself, which in turn may be more multifaceted, messy and unyielding to our enquiries than typically assumed (Law, 2004; Law and Singleton, 2005, 2013; Shotter, 2006). Such thinking is not new to process organization studies, though can be contrasted against the substantialist perspective dominant within organization studies generally, in which a lack of clarity or misunderstanding is assumed to be the result of error or poor application of method (Law, 2004; Law and Singleton 2005). A process perspective, contrary to this, holds that it is necessary to engage with things in their active, unfixed forms, considering their heterogeneity, movement and change (Helin et al., 2014; Hernes and Maitlis, 2010). As such, an initial lack of clarity is often productively rethought from a process perspective as an openness to novelty (Shotter, 2008), with theorists recognizing that things that may change cannot be fully known in advance (Nayak, 2008). Some process accounts may go even further, challenging the assumption that straightening out messy, entangled phenomena is even the desired goal. John Shotter captures this methodological orientation in his distinction between *aboutness* thinking, which attempts to clearly establish what things are, and *withness* thinking, which "becomes available to us in our relations with living forms, when we can enter into dynamic or dialogical relations with them" (2006, p.586); raising, in turn, the question of how organizational concepts can best serve practice (Simpson, Tracey and Weston, 2018).

From a substantialist, '*aboutness*' perspective, techniques can appear as so many fixed actions -mechanical operations of inputs and outputs, with change proceeding

along what Shotter describes as a "single 'pictorial' order of connectedness" (2006, p.586; Tsoukas and Chia, 2002). A processual, '*withness'* perspective however, begins with the view that such stability is only relative, and continuously "created as actors form recognizable relational wholes" (Hernes, 2010, p.167). A process view may therefore accommodate the partial connections being pieced together as action takes place, providing an ideal grounding to consider different elements of a not-yet-formed or shifting object of inquiry such as technique. This onto-epistemological position also forms a defining feature of Science and Technology Studies, proponents of which argued that the social context in which science is made was of equal importance to the scientific knowledge thought to guide its development (Latour and Woolgar, 1979; Latour, 1987; Bijker et al. 1987). The result was the emergence of a more complex image of reality which, rather than a singular, definite construct, was one in which the political, natural, discursive, scientific and cultural were all blended together, interconnected and constituted in unexpected ways (Latour, 1987, 1993, 1999; Knorr-Cetina, 1992; Mol, 1999, 2002).

Underpinning both process and STS studies is the suggestion that reality can best be understood in terms of *multiplicity* (Mol, 1999; Law, 2004): a concept that emerged from the rejection of both Platonic, eidetic forms and Aristotelian hylomorphism (Protevi, 2001; Wood, 2002). In seeking to account for the dichotomy of sameness and difference identified in classical philosophy (Chia, 1996), multiplicity rejects both Platonic explanations of eternal ideas, and Aristotelian explanations of things intelligible in relation to the totality of their material expression and form. Instead, philosophers such as Gilles Deleuze argue that "states of things are neither unities nor totalities" (Deleuze and Parnet, 1987, p.vii), but are rather composed of

“dimensions which are irreducible to one another” (p.vii). Understood as multiplicity, reality is therefore not something which “has many parts; it is what is "complicated," or folded many times over and in many ways such that there is no completely unfolded state” (Rajchman, 2000, p.60).

This idea can be used to further advance the Bergsonian distinction of qualitative and quantitative multiplicities previously referred to in chapter one, which outline how the world around us can be conceived as ordered, measureable and discrete on the one hand and creative, heterogeneous and irreducible on the other (Bergson, 2002; Deleuze, 1991). Building upon this distinction, Linstead and Thanem (2007), for example, offer the example of an object which is either hot or cold, a feature which, in terms of quantitative multiplicity, can be measured using the same metric, as “its capacity to withstand a multiplicity of temperatures can…only be demonstrated sequentially” (p.1487). The authors note that one could not however, utilise the same distinction when considering happiness and sadness, treating the former as an absence of the later, for psychical life presents many occasions in which one may be tinged with the other. Linstead and Thanem also point to Deleuze’s use of the Bergsonian concept (1991; Deleuze and Guattari, 2004) to describe a qualitative *multiplicity of organization* and a quantitative *multiplicity of order*. These two multiplicities, they argue, rather than being synonymous, can be used to show how change and organization are not so easily opposed. Rather, “change and organization are imbricated in each other in a continuously responsive conversation” (2007, p.1485).

For STS scholars, affirming multiplicity leads to the rejection of the idea of a singular, aggregated reality. As Deleuze argued, such features are instead held to

develop or cohere *from* multiplicities, emerging as "focuses of unification" (Deleuze and Parnet, 1987, p.viii; Law, 2002), challenging its "alleged stable, given, universal character" (Mol, 1999, p.75). Instead of a pre-determined set of elements forming the building blocks of human experience, the concept of multiplicity is utilised by STS and process scholars to describe "an unformed but generative flux of forces and relations that work to produce particular realities" (Law, 2004, p.7) from which individuals and institutions emerge. The reference to relations here is important, for in a multiplicity, as Deleuze notes, "what counts are not the terms or the elements, but what there is 'between'" (Deleuze and Parnet, 1987, p.viii). Thus, in their ethnographies, both process and STS scholars draw attention to the flux of partial connections formed between the different elements under study, describing realities that are at once "historically, culturally and materially located" (Mol, 1999, p.75).

In recognising multiplicity, it is also clear within STS scholarship that the validity of science (and traditional research methods) is not denied outright. As John Law notes, there are obviously things "which can indeed be made clear and definite. Income distributions, global CO2 emissions, the boundaries of nation states" (2004, p.2) being some examples familiar to the social sciences. However, "alongside such phenomena the world is also textured in quite different ways" (2004, p.2) and scientific analysis, though well suited to uncovering certain aspects, may be poor at uncovering others.

Critically, addressing multiplicity in research is therefore an issue of *method* (Steyaert, Marti and Michels, 2012), specifically the appropriateness of certain approaches and (at times dogmatic) belief that the correct application of method will lead to a correct view of the world under study (Law, 2004; Deleuze, 2006).

On this point, it is worth drawing attention to John Law's (2004) account, which argues that researchers often find themselves dealing with things that are "complex, diffuse and messy" (2004, p.2), and which the social sciences inevitably make a mess of by attempting to provide categorical, clear cut descriptions. By maintaining a narrow methodological approach and denying multiplicity, the social sciences often end up at an impasse: either objects of research are defined, ordered and knowable, or they are diffuse, messy and as a result, unknowable. This approach, which has proven successful in some areas, inevitably leaves other aspects of reality by the wayside, and in Law's view may in fact deny different realities from being captured in our studies.

In light of the issues raised thus far, it seems sensible to list technique among those things which are "textured in quite different ways" as described by John Law. A problematic object of study, technique naturally presents itself as something that is not wholly attributable to nature or culture, subject or object, social nor material (Latour, 1993; Barley, 1996; Orlikowski, 2007). Similarly, though techniques are necessarily invoked by the domains of discourse, intelligence, science, psychology, mechanics and economics, none are sufficient to capture technique in its entirety (Steigler, 1998). The great challenge of trying to dismantle technique, or place it within one domain at the expense of others is therefore unlikely to be successful. By contrast, accepting the proposition that technique is not necessarily *meant* to be understood as a singular construct -that it may itself reflect the multiplicity which many STS and process scholars have proposed following their investigations (in which techniques feature heavily) -holds promise.

How then, are we best to go about researching the creativity of technique in this

manner? The first issue to address is one of method, which requires critical reconsideration. Nayak (2008), in his account of process thinking, is sceptical of method's universal capacity. Rather than assuming method will always lead us to the correct theoretical outcome, Nayak suggests instead that "[i]nterest, obviousness, connections, believability, beauty…define theories in the process of provoking, calling forth experimentation and going beyond established modes of thought" (p.186). Linstead (1993) argued that recognition of this state of affairs is not necessarily pessimistic, envisaging a type of ethnography in which:

> Poetic rigor and conceptual rigor will ultimately combine in the production of the account, which will employ explicit literary and figurative devices poised in the space between "fact" and "fiction" where "truth" is manufactured (p.116).

If organizational research is to achieve the sort of rigor Linstead is proposing, it must begin by divesting itself from what John Law describes as the *singularity* of method. In the social sciences, Law argues, method is attached to a particular image of rigour: the idea being that it is "important to obtain the best and technically robust possible account of reality" and that this reality is assumed to be "a pretty determinate set of discoverable entities and processes" (2004, p.9). Whilst in organizational research we may criticise certain research approaches, rules or procedures, we do not question the *overall need* for method, for its rules and procedures.

As a result, we remain in a worldview which is determined to separate the truth from falsity and arrive at a singular, true description of phenomena. Law argues, however, that when we *do* question this commitment, we break from the idea of a singular 'truth as good' to the view of 'truth as *a* good': that is, a potential product of inquiry. Law highlights Latour and Woolgar's Laboratory Life (1979) as an example of what

happens when we reject the idea that "nature somehow impresses its reality directly on those who study it if they just set aside their own biases" (Law, 2004, p.19). Tracing the social construction of a scientific fact, Latour and Woolgar set aside a different set of biases, those which underpin our idea of method, and refuse to dismiss the practice of science as at least partly constitutive of something that is later held as having a separate empirical existence.

The point of such studies is not, as Latour has made clear, to undermine science, but rather to argue that within the production of knowledge "there is truth and there is reality, but there is neither correspondence nor *adequatio*" (1999b, p.54). Beyond the idea of true and false descriptions there lies a complex multiplicity of differences, a "taking on, evading, hedging, coming back to, recanting, solving, refuting and unpacking" of the central issue "that on the one hand facts are experimentally made up and never escape from their manmade settings, and on the other hand it is essential that facts are *not* and that something emerges that is *not* manmade" (Latour, 1999b, p.125). Taking this into consideration will, as Law (2004) argues, create space for a more generous understanding of method which actively seeks to uncover areas of reality previously dismissed as messy, indeterminate or unworthy of study. This degree of openness to the multiplicity of reality, emphasised in particular by resisting order by refusing to draw *a priori* assumptions on who or what does the organizing (Latour, 2005b; Czarniawska, 2004) and paying attention instead to the procesual qualities involved (Shotter, 2006; Linstead and Thanem, 2007; Langley et al. 2013), informs a number of studies which have examined the construction of technical objects and the challenges faced therein (Latour, 1979, 1987; Law, 1994, 2004; Czarniawska, 2008; Suchman, 2007; Law and Singleton, 2005). In dialogue

with such studies, and with the open approach their authors have called for, the current work proposes an experimental methodology.

An Experimental Methodology

Whether reality is treated as a singular, knowable entity, or a messy, multiple flux of different forces, this research must proceed towards the aim of generating insights into how technique can be understood as contributing toward creative practice, which in turn requires some form of roadmap. Czarniawska notes that in the face of an undifferentiated reality, humans naturally (and often unreflectively) impose order on experience, organizing it in order to act and interpret situations as they unfold. However, "being technologically minded, people are also able to construct instruments to facilitate such endeavours intentionally; they call these *methods*, *theories*, *paradigms*, and *frames*" (1997, p.1, emphasis in original). Whilst we are accustomed to method being functional, instrumental, even standardised, Czarniawska argues that it can also be loose, artful and idiosyncratic. So, rather than a rigidly applied method, we can just as easily speak of different research methods, devices, tools and interventions *concocted* together (1997) or arranged in specific *method assemblages* (Law, 2004) to detect and amplify certain realities. Following Czarniawska's suggestion, I will add to this list the role of *experimentation*. Research may be considered a type of experiment, because the researcher must always act, devise a test, a set-up, or contrive a situation which s/he hopes will have an effect. In this way, organizational research (in all its forms) is not so different to scientific practice, in which experimentation and experimental reasoning, the "movement in which reasoning makes itself by way of tracing, by playing with material entities" (Rheinberger, 1992, p.306-7) acts as a focal point for

investigation.[1] In each case the course of action is the same: one needs to determine a path or develop a theory; but the resources to do so are not immediately present, there is nothing yet to distinguish or lend credence to an idea. “So experiment” (Deleuze and Guattari, 2004, p.277). An experiment can, of course, take many different forms, ranging from the precision of the laboratory to the silent focus and material engagement of the artist’s workshop (Siukonen, 2010). What connects each of them is that they are all required to make sense of reality, and therefore have to manufacture or engage responsively (Shotter, 2006) with a situation to study it, to see what happens. Furthermore, the idea of experimentation also allows for a degree of flexibility and an orientation toward novelty[2]. Given pervasive nature of both creativity and technique, this orientation holds value for the present study. Recognising the need to experiment, the inquiry can then turn to the scenarios, tools and instruments (material or conceptual) to be devised and constructed (Czarniawska, 1997) to uncover the creativity of technique. In line with the previous discussion on multiplicity, it is also necessary to consider the ways in which these features are connected, and their relative inseparability. As Karen Barad (2003) argues, the primary way in which we experiment and engage with reality is through the deployment and use of an apparatus.[3] In Barad’s view, such apparatuses are not distinct from the phenomena to be understood, but are rather part of the same ongoing, entangled relations: “Humans” do not simply assemble different apparatuses for satisfying particular knowledge projects but are themselves specific local parts of the world’s ongoing reconfiguring” (2003, p.829). The outcome of a particular experiment results in a temporary form of organization, described by Barad as an ‘Agential cut*’*, which locally resolves the phenomena by marking and

ordering different components of reality,[4] temporarily separating them and making them intelligible in respect to one another. As Barad's description suggests, experimentation and the use of apparatuses should not automatically invoke images of sterile instruments or laboratory conditions. Rather her description invites experimentation of the kind envisaged by the Pragmatists as noted in chapter one (Bernstein, 1971; Styhre and Sundgren, 2005a).

Indeed, much of what is described above is already undertaken by human bodies in everyday situations, testing the strength of physical or mental structures they face up against. In this sense, there is very little difference between observation and experimentation (Latour, 1990a), as to be present is necessarily to alter an environment. An important difference does however, rest upon "being *experienced* and being an *experimenter*" (Latour, 1990a, p.56). Much of what informs everyday experience, such as tacit knowledge and learned responsiveness, is gained through experimentation (Ingold, 2000). For Latour, this "skill, knowledge and knowhow…exists, but incorporated, embodied in the very flesh of the experienced person" (1990a, p.56). What turns the experienced person into an authentic experimenter is when this know-how or knowledge is "*excorporated…*inscribed and turned into papers and maps" (1990a, p.56). The decisive aspect is the process, the recognition, translation and presentation of a feature which is true for the researcher, designer or scientist. It is not enough to just know or blindly guess when stating that things behave in a certain way, there must also be an explanation, an account of how the position has been reached, and a description of what has been included and excluded (Law, 2004). As Latour argues, to qualify as an experiment "[o]nly three things matter: that there is a trial, that there is an inscription, [and] that there is a

point…to be made or unmade" (1990a, p.57).

Ethnography

Taking inspiration from these arguments, my own experimental research design drew upon ethnographic and anthropological approaches, utilising observation, field notes, interviews, and the collection of images and artefacts to address the research problem. Often described as an immersive study embedded within a particular culture, ethnography is traditionally aimed at understanding human experience, complete with its "language, rituals, institutions, behaviors, artifacts, and interactions" (Cunliffe, 2010, p.227). A mainstay of anthropological and sociological research, ethnography has also been advocated as a useful tool in both STS (Latour and Woolgar, 1978; Mol, 2002, Law, 1994, 2002) and Organization studies (Linstead, 1993; Casey, 1995; Orr, 1996; Gherardi and Nicolini, 2002; Czarniawska, 2008), with a rich and varied history of different contexts and applications. Definitions accordingly range across the demands and philosophical assumptions of different disciplines, however Watson (2011) suggests that it is most usefully defined as a "*style of social science writing which draws upon the writer's close observation of and involvement with people in a particular social setting and relates the words spoken and the practices observed or experienced to the overall cultural framework within which they occurred*" (p.205-6, emphasis in original).

Given the diversity of methods and approaches covered by ethnography, I would like to clarify my specific use of the term, and the ways in which I consider the research project to be ethnographic. To be clear, there can rightfully be some hesitation in describing any organizational study in as an ethnography, as many (and this one is no exception) are perhaps better described as employing ethnographic methodologies

(Pink, Tutt, Dainty and Gibb, 2010). There are two reasons for this. Firstly, ethnography carries with it certain expectations, which, if not adhered to, may invite criticism. These expectations include researching a social context with which the ethnographer is not accustomed (Latour, 1993), immersing oneself within that particular context for an extended period of time (Bate, 1997), and ultimately, providing an understanding of how certain social groups perceive the world, with the aim of finding some universal features (Ingold, 2008; Van Maanen, 2011a).

On these points it is instructive to consider Tim Ingold's position, that the objective of ethnography is "to describe the lives of people other than ourselves, with an accuracy and sensitivity honed by detailed observation and prolonged first-hand experience" (2008, p.69). In contrast to this description, what I intend to achieve with my experimental methodology is perhaps closer to his description of *Anthropology*, which, Ingold suggests, is not an armchair activity of speculation but the act of "embedding…our observational engagements with the world and in our collaborations and correspondences and inhabitants" (2008, p.90). The second more general point, in line with my aim to engage with multiplicity, is that this research is not strictly concerned with developing an understanding of the lifestyle or culture of a particular group. My aim, as described previously, is to account for how technique contributes toward creative practice which, though using an ethnographic approach, does not necessarily adhere to the traditional aims and outcomes of ethnography. I therefore suggest that an experimental approach may take on some slightly different features to the classic ethnography, which have also notably informed organizational approaches to ethnographic practice.

The idea that ethnography may take on different forms than those found within social

science studies has been effectively deployed within organization studies. Barbara Czarniawska (1997, 2004, 2008) for example, argues that in contrast to traditional ethnographic settings, studying organizing in real time must account for the fact that action is often fast moving, difficult to follow, and distributed across multiple different times and locations. The challenge of trying to provide a holistic of an organizational culture under study is therefore greatly increased, resulting in a difficult task for the researcher. Such difficulties are also echoed in accounts found within STS. John Law, for example, in his ethnography of the Daresbury Laboratory, recounts "a terrible anxiety about being in the right place at the right time. Wherever I happened to be, the action was not" (1994, p.45), unable to keep up with the fast paced and distributed processes which occurred around him.

These challenges therefore call for the current study to adopt an alternative approach to ethnographic practice. Recent suggestions have included more mobile approaches to capturing events, such as shadowing people as they move from place to place (Czarniawska, 2014; Sclavi, 2007) or following technical objects (Latour, 1996; 2005b; Bruni, 2005). In line with these recent approaches, my own research aim, to understand technique and its relevance to creative practice, necessarily requires a degree of flexibility, having to navigate and (where possible) be present at those moments when the two worlds described by Barley (1996) – the material and the representational- came together in the formation of new products and outcomes. The best way to do this was to rely on the tools of ethnography, particularly observation, which, alongside the collection of interviews, images and artefacts, forms the next key component of an experimental methodology.

Observation

Ethnography, as Watson's (2011) earlier definition suggests, primarily involves two things: *close observation of and involvement with people in a particular social setting*. Building on this definition, I wish to focus on two aspects of observation (entanglement and abduction) which I believe help separate ethnography more broadly from other approaches and aid the process of experimentation. Before doing so however, it is important to briefly delineate from traditional assumptions about what the act of observation entails. Observation, in the scientific sense, allows the researcher to account for changes in states and the occurrence of events. From these observations, causality can be determined in a stepwise manner, in which contributing factors or antecedents are identified. Similarly, direct observation can therefore turn ethnography toward a realist reportage of what has taken place, allowing the researcher to survey the goings-on and account for them accurately, providing a factual account.

However, given the issue of multiplicity noted earlier, this viewpoint is not unilaterally applicable. Indeed, the idea of ethnography providing some form of objective point of observation is must be called into question (Stewart, 2007; Law, 2004). As I noted earlier, discussing the work of Karen Barad and Bruno Latour, the act of observation (itself a form of experimentation) cannot help but alter the environment. On this point John Law, building on the feminist technoscience writer Donna Haraway (1991), is critical of the so called 'God-trick' employed by accounts which purport to offer a value-free, objective analysis in their ethnographies. Instead, Law argues that:

> We are caught up in sets of relations that simultaneously have to do with meanings and with materials… We are entangled in our flesh, in our versions of vision, and in relations of power that pass through and are articulated by us. So detachment is impossible. At best a self-delusion, more often it is also a

form of irresponsibility (2004, p.64).

Following Law, I argue that rather than a disadvantage, it is from this entanglement and interrelation that the first benefit of observation emerges. For unlike other approaches, observation allows the researcher to engage with action in its *entelechy*: it allows the researcher to consider organizing and organizations as they happen (Schatzki, 2006; Czarniawska, 2008). Whilst retrospective accounts of action hold considerable benefits (as I will discuss later), one can never be sure what has been amplified, embellished, exempted, even erased or reconstructed in its re-telling (Riessman, 2008). Observation, on the other hand, allows the researcher to directly experience what is occurring. To be clear, directness is not an appeal to factual reportage, rather, that it allows the researcher, in their own process of discerning which aspects to bring forward (and necessarily retract) to account reflexively for both their own presence, and the presence of others as action is undertaken (Shotter, 2006).

The second benefit of observation, as I have described it, is the recourse it offers to theory generation and development. I have mentioned earlier Tim Ingold's description of anthropology, which he considers to be the act of "embedding…our observational engagements with the world and in our collaborations and correspondences and inhabitants" (2008, p.90). This description, in its outlook, shares much with recent developments within organizational methodology, which have sought to make clear the relationship between empirical engagement and the production of theory (Alvesson and Karreman, 2007; Alvesson and Sandberg, 2011). Typically, research is understood to proceed on the basis of either repeated observations leading to a hypothesis (*induction*), or a theory being hypothesised and supported by observation (*deduction*). However, there is also a third logic, *abduction*, which is associated with discovering

the new (Mantere and Ketokivi, 2013).

As Styhre and Sundgren (2005b) note, "[i]n order to be able to experiment, one must doubt. Peirce (1992, p. 115) says that "there must be a real and living doubt, and without this all discussion is idle." (2005b, p.55). But how to make this 'real and living doubt' generative? Following the pragmatist tradition noted in chapter one, we may turn to the logic of abduction. Abduction involves a form of conjecture, a type of guesswork developed through an iterative cycle of correspondence between theory and empirical reality (Locke, Golden-Biddle and Feldman, 2008; Mantere and Ketokivi, 2013). Beyond its place in discussions of logic abduction also captures part of the creative process of the search; a type of reasoning that observes events and considers new explanations or possibilities. It is not aimed at certainty or based solely on empirical verification, but rather is deployed when deduction and induction are insufficient. This type of reasoning is connected to an experimental methodology primarily because although a scenario may be contrived to provide insight or an answer to a question, things do not always work out as planned, and we cannot always know in advance what to expect or what the outcome will be. This point is also raised in Rheinberger's discussion of scientific practice, comparing the process of experimentation to a Daedalian construction:

> An experimental system is a labyrinth, whose walls, in the course of being erected, in one and the same movement blind and guide the experimenter. The construction principle of a labyrinth consists of the existing walls limiting the space and the direction of the walls to be added. A labyrinth cannot be planned. It forces movement by means and by virtue of checking out, of groping, of *tâtonnement* (1998, p.287, emphasis in original).[5]

To experiment, as I have noted, is to set about finding something out or solving a problem, to place thought on trial against reality (Latour, 1990a) and see what emerges.

However, as Rheinberger's Daedalian reference suggests[6], we cannot assume simple correspondence between the two, as reality is messy, multiple and not always in accord with thought (Deleuze 2004; Law, 2004). This is why abduction is important. As a way of searching and acting when presented with something novel or surprising, abduction allows us take the surprising features into account, to learn and respond appropriately (Garud, Dunbar, and Bartel, 2011). Abductive reasoning, as Rheinberger's reference to the labyrinth suggests, should not be treated as a simple or straightforward task. To reason abductively requires both a sensitivity to what is occurring and to permit a degree of imagination, as solutions or proposals will neither be evident or pre-existing. Because of this, abduction is greatly aided by being the presence afforded though observation. To have access to observe things as they happened, changes as they occur, is to provide abduction with the necessary stimulus from which a creative response (on behalf of the researcher) can emerge.

Field notes, Interviews and Images

Alongside the practice of observation, there are also tools, commonly used within organizational ethnographies, which further serve to highlight aspects of the different realities under study. As Mol (1999) notes, when dealing with multiplicity, a different set of guiding principles is required. Mol argues that in contrast to the metaphors of perspective and construction[7], "intervention and performance… suggest a reality which is *done* and *enacted*" (p.77). It is here, then, that it is important to make reference to the tools through which performance and enactment are achieved. As I have argued earlier, action does not take place in order to be passively documented at a distance by the researcher. Rather, all are involved, implicated, *quid pro quo,* and "while realities may clash at some points, elsewhere the various

performances…may *collaborate* and even *depend on* one another" (Mol, 1999, p.83). During the course of the fieldwork many different things were thrown up in the air (objects, tools, techniques, opinions, descriptions, diagrams, conversations, agreements) aspects that made up daily life, and which were naturally patterned and held in place by certain features: narratives, stories, images and laws. Certain parts will therefore form the centre of attention at one point and be less important in the next, and may be more relevant to certain descriptions of reality than to others. The challenge of research is, as Rheinberger noted, that it is both guided and blinded by what is available and the choices made, it is always a matter of inclusion and exclusion (Law, 2004).

To aid this process of searching amongst these different things, research may therefore make use of certain tools, offering opportunities for reflection, dialogue and engagement with different semiotic mediums. In respect to my own research, I aim to explore these different aspects through the use of field notes, interviews and images. Often a primary source for ethnographic and anthropological texts, field notes are deployed to capture what occurs beyond the description provided by the participants, providing a sense of place, non-verbal gestures and actions that occur (Van Maanen, 2011b; Eisenhardt, 1989). Interviews, a key feature of many organizational studies, offer a chance to situate actions and decisions within a wider context. I have mentioned previously that observation and engagement with action as it happens holds some key benefits, particularly for developing an account of what is going on. This does not mean however, that the participant's insights hold no value or are to be treated with mistrust. On this point Czarniawska refers to the philosopher Richard Rorty who notes that it can be:

> A mistake to think of somebody's own account of his own behaviour or culture as epistemically privileged. He might have a good account of what he is doing or he might not, but it *not* a mistake to think of it as morally privileged. We have a duty to listen to his account, not because he has privileged access to his own motives but because he is a human being like ourselves (1982, p.202, as cited in Czarniawska, 1997, p.21).

Interviews, which allow the participants to express themselves candidly, and with the ability to reflect on a situation as it occurs, therefore provides a valuable supporting resource to theory development, but more importantly, is, as Rorty suggests, a moral issue, if research is to proceed on the basis of mutual dialogue and respect (Shotter, 2006; see also Law, 1994, p.16). The final tool to complete my experimental methodology is the use of images (Bell and Davison, 2013), and collection of artefacts (Suchman, Trigg and Blomberg, 2002) taken from the research sites. The primary purpose of taking photographs is to help capture the technical processes under study, which naturally escape simple description. Likewise, artefacts (such as draft training manuals or finished products) will provide further context to the issues discussed in the study.

Research Context

Having described an experimental methodology built upon insights from process organization studies and STS, I now turn to the empirical context in which the research was conducted. Following the arguments made previously, I chose to focus on design-led organizations, which I refer to broadly as an organization that explicitly identifies as having some form of artistic, creative, design influence or input on the production of a good or service. This particular type of organization was

chosen for two reasons.

Firstly, design-led organizations offer a suitable context to explore the processes of production *before* the product or outcome reaches a stage of completion. The primary benefit of arriving at this stage, prior to the conclusion of a product or outcome, is to avoid the so-called "black-boxing" (Callon and Latour, 1981; Latour, 2005b) of technical matters. Black-boxing describes the process (often found in retrospective accounts of technical action) by which the creative transformations of a product's development become hidden behind the solidity of the finished product, or deliberately erased by the producer (Latour, 2002). Such actions are, of course, necessary for a finished product to emerge, as the designer 'pre-scribes' their intentions during the process of production (Akrich, 1992). As such, the black-boxing of a finished technical outcome is often taken as a marker "of its own success" (Latour, 1999b, p.304), as the more a product fulfils its desired purpose, the less obvious the complexities that went into its construction become.

Dealing only with a finished product however, provides an incomplete picture, which can often obscure the processes that inform its development. As the character of many of the technical objects which furnish contemporary life often display this finished, well defined character (Latour, 1987, Flusser, 1999; Anusas and Ingold, 2013), it was deemed useful to find an environment where things were still relatively undetermined.

Likewise, insight into what happens before a product is finished can also provide a useful perspective for understanding creative practice, which, if it is to be understood in terms of process (rather than variance based research: Fortwengel, Schüßler and Sydow, 2017; Langley et al., 2013), can only gain so much from an ex-post analysis.

I shall explore this issue in greater depth in chapter four, however at present it is worth noting that a number of organizational studies of creativity are based on such ex-post methodologies, addressing the creative product after the processes of formation have occurred (Styhre and Sundgren, 2005a; Styhre and Eriksson, 2008). Studying design led organizations, within which the construction (and problematizing) of technical objects and processes is commonplace, can therefore affords the current study "an opportunity to investigate the imaginative and practical activities through which socio-material relations are reproduced and transformed" (Suchman, Trigg and Blomberg, 2002, p.164).

The second reason for placing my research in the context of design led organizations is that these organizations operate in a sector of the economy which is explicitly involved in "creative" work (Florida, 2003; Smith and McKinlay, 2009). This is useful to the current study because although the work is not inherently more creative than that found anywhere else, it is more commonly recognised (or self-certified) as *creative*. In design led organizations, it was deemed much more likely to find individuals who consider it their job to be creative, engaging in undetermined, "artful making" (Austin and Devin, 2003) and therefore more likely to encounter a shared discourse or culture on what it means to work *creatively* (Wang and Ilhan, 2009; Jelinek, Romme and Boland, 2008). Whilst there is rightly a critical discussion on the use of the term "creative" when describing modern work practices (Magyari-Beck, 1994, Osborne, 2003; Gill and Pratt, 2008; Thompson, Jones and Warhurst, 2007) it nevertheless offers a pragmatic reason to conduct research in this particular context. Research in similar domains, such as creative hubs (Drake, 2003), architectural studios (Carlsen, Clegg, and Gjersvik, 2012) and communities centred

on craft (Glăveanu, 2012) have proven productive sites for inquiry into creative practice, exhibiting characteristics of playfulness, collaboration and freedom from strict management control (Austin and Devin, 2003; Mainemelis and Ronson, 2006). Contrastingly, in domains where this is not so obviously the case, such as waste disposal or financial reporting, "Creativity" expressed as a deviation from normal practice would likely be perceived as potentially dangerous or unethical[8]. For these reasons, design led organizations were chosen as a suitable context for the research. Having identified design led organizations as a suitable context to explore how the everyday creativity of technical action occurs in practice, I began to identify potential locations for the study. These included a number of different types of organization, including architecture firms, engineering projects, theatre companies and various design agencies and consultancies. Access was however, finally secured with two design-led organizations, which I have named Atlas and Helios respectively. Both agreed to participate and in both studios I was present as an observer. At the time of research I had no expertise in any of the technical processes or design practices I observed, though was occasionally invited to participate to better understand whatever tool or process was being utilized.

My research began in autumn 2014 and ended in spring 2015. Prior to this, a research proposal was submitted outlining any ethical concerns, and ethical approval for the study was granted by the University of Strathclyde. The research concept was pitched to both studios, with a chance for the designers to ask questions before the study began. Participant information forms were distributed to the designers explaining the research aims and how the data would be managed. During the fieldwork, I typically spent 2-3 days per week in each site, and attended each for 3 months. On the days that I was not

at the research site, I would either review the information gathered or seek out theoretical perspectives on what I had encountered. In the Atlas studio, I would normally sit with the staff designers, who would work their way around particular machines during the day, depending on what was being done. In the Helios studio, I would attend meetings or events marked for interest at the start of the working week and occasionally work in the studio, in case anything interesting took place.

The fieldwork began at the Atlas studio, described both as a rapid prototyping facility and a space for makers, which emerged as a spinoff from MIT's Fablab (Fabulation Laboratory) concept. The Atlas studio was heavily influenced by the recent maker movement (Dougherty, 2012) which has sought to reengage with the traditional actions of tinkering, fixing and making one's own goods. To this end, the purpose of the Atlas studio was to provide designers with access to types of machinery which would previously only have been available at an industrial scale. However, thanks to advances in both industrial processes and the types of software available, it has become possible for such facilities to be offered at a smaller scale, in turn offering new opportunities for designers. The Atlas studio was eager to provide access to this machinery, which they regarded as helping to democratise production by offering access to those who previously would not have had it. At the time of research, the Atlas studio had two spaces: a central hub that included access to smaller scale prototyping tools (laser cutting, 3D printing, machinery for working with fabrics, smaller Computer Aided Design (CAD) driven machinery for woodwork) as well as office space for the Atlas staff and designers, and a second space which housed larger industrial machinery (such as larger CAD machinery for woodwork and laser cutting). The Atlas studio dealt with a range of different clients,

from design students to commercial ventures. The designers in the Atlas studio also took on a series of commissions as well as their own personal projects, whilst offering support to those wishing to use the technical facilities. I spent my time primarily with these designers, focusing on their daily activities and personal projects, which included a variety of activities, from 3D printed plastic models to wooden prototypes of furniture.

The Helios studio, meanwhile, specialised in graphic design, though often delved into a range of different activities, with the final product passing through a number of different mediums (material, digital, spatial). Work was primarily undertaken through the use of design software on personal computers, which accounted for much of the weekly work schedule. Projects involving photography or other mediums typically occurred offsite. The studio featured large desks, reminiscent of the drafting tables used by architects, and separate spaces for group discussion and project development. Collected on shelves reaching from the floor to the ceiling were various design materials, including books, magazines, previous commissions, objects and photographs. Projects ranged from commercial ventures to developments in arts and culture, local government and the third sector. Work was often collaborative, either between the client and the designers, or in connection with a series of specialist contractors (such as sound engineers, animators and photographers). The working week would usually begin with an overview of what was happening, including details of any new business, progress on existing projects, with each designer assigning a number of days (often subdivided into half or quarter days) to each project they were involved in.

Once the empirical material had been gathered, audio recordings of meetings,

conversations and interviews were selected and transcribed. Selected transcriptions where then combined with field notes to reproduce accounts of certain events, coupled with images of the work being undertaken. With regard to analysis of the empirical material, it was my intention to try and retain as much of the immediacy of the data as possible. In doing so, I have chosen not to over-code the empirical data. Rather, I prefer that the inherent messiness of the discussions and narratives captured is maintained (Lambotte and Meunier, 2013). It has notably been argued by process scholars that when dealing with multiplicity, the borders between collection, analysis and presentation may blur or overlap (Steyaert, Marti and Michels, 2012).

Challenges

Like any empirical work, the study faced some challenges. These are of course to be expected, as many authors have noted research practice involves good timing, making do, and more often than not, good fortune. Research accounts will complain of access issues, though these are not always issues of research design or recalcitrance. In the Atlas and Helios studios I was made to feel welcome and found both to be obliging in my requests to try and capture how things worked. Nevertheless, difficulties presented themselves for which no-one is at fault. I found for example, that computers in particular often marked a dead end for my enquiries. It is incredibly difficult, for both the researcher and the participant, to follow and be followed when operating a personal computer. This was particularly visible in accounting for the use of graphic design software. For a designer, this is where much of their wrestling and elbow-grease is applied. There will be wrong-turns, editions, re-starts and ways of working through which, under the scrutiny of someone watching (never mind asking for explanations) is terminal for the process itself. As a researcher, I found this to be an invasion of

privacy, and took an ethical decision not to pursue this, at the cost of losing sight of parts of the production process. As Czarniawska notes, in any research project there will be "variations in observation techniques, although they tend to blur in the field. …The choice is always that of the researcher, and it is often an ethical as much as a methodological choice." (2014, p.43). Designers were able to describe the process during interviews, which has subsequently become a larger part of the study than I initially planned. The difference is largely in the situated presentation of some events in this text alongside the recollections of events also presented.

Reflexivity

Considering the implications of multiplicity, it is clear that things can always be otherwise, that research can turn out in different ways or lead to different conclusions than expected. The importance of reflexivity both from the view of justifying the value of research, and from an ethical standpoint is a key element of research practice. Whilst there are perhaps more elaborate frameworks (Alvesson 2003; Johnson and Duberley, 2003), John Law (1994), as part of his plea for a modest Sociology describes the principle simply as "act unto yourself as you would onto others" (p.16). By applying one's critical gaze onto one's own practice, it becomes possible to account for errors or gaps, and in making those clear, provide a more robust account of the value of the work and how it may contribute to further academic discussion.

With this in mind I would like to reflect briefly on the research process. The views expressed in this chapter (or at least protean forms of them), informed the study undertaken in the Atlas and Helios studios in autumn 2014 to spring 2015. As is likely clear from my methodology, I was heavily influenced by process studies and by the accounts of Latour, Law and other STS authors, who, on reflection, are more

forthcoming about the production of their texts than their field techniques. Looking back, I now appreciate that many STS authors are also very adept ethnographers, and that the strength of their accounts owes much to their ability to capture the richness of realities they explore. My biggest regret, which I only came to appreciate much later, was overlooking Garfinkel's ethnomethodology, possibly the largest methodological influence on STS accounts. As will become clear from the study, although I am attentive to Latour's work (and its relevance to process thinking), I am somewhat ambivalent to his suggestions for method. In particular, the suggestion of a deliberately reduced vocabulary not only fails to reflect some of the most interesting things said by STS theorists,[9] but also invites equally reductive criticism (such as by Ingold, 2008, 2012; see also Latour, 2013), which I sought to avoid. What I failed to realise, and where the connection to Garfinkel is important, is that such theoretical restrictions can help the researcher observe what is going on without the comfort of his/her chosen explanations. As Latour also notes, "[e]ven when we are in midst of things, with our eyes and ears on the lookout, we miss most of what has happened" (2005b, p.123). This is the case for a number of reasons, however in my own experience, I wonder if my eagerness to theorise led to things being missed. I do not believe I was blinded by any particular theory (the fieldwork seemed to constantly suggest alternatives) but rather the promise of theory in general, that the answers were more likely to be found in research texts than the empirical setting. I do not think this has negatively impacted the present study, though a little more faith and attention to detail in the practice of observing and documenting events would have saved much hand-wringing and likely further enriched the topics described in the study.

Conclusion

In this chapter I have presented the methodological arguments that inform the study, and the methods with which I intend to explore the creativity of technique. Highlighting the difficulties raised by researching technique, I have presented an onto-epistemological position, building upon arguments developed within process organization studies and STS. I have argued in particular for a focus on multiplicity (Mol, 1999; Law, 2004), and its relevance to the research aims. I have then described my approach to fieldwork. Taking inspiration from ethnographic and anthropological works, I have presented an experimental methodology, utilising a series of methods (field notes, interviews, images and artefacts,) which, when taken together, can help offer insight into the ways in which technique contributes toward creative practice. Following this, a description of the organizational context in which the research has been undertaken was provided. I have then identified design-led organizations as a suitable location to explore the processes which occur before the "black-boxing" of technical objects (Callon and Latour, 1981) and also offer an explicit dialogue on working creatively (Wang and Ilhan, 2009). I have introduced the Atlas and Helios studios and provided a description of the research process, ethical considerations, a discussion on reflexivity and a summary of the main points developed.

In the next chapter, I consider technique in light of process organization studies. Drawing on the works from the fields of anthropology, philosophy and sociology, as well as process studies of technical action, this chapter aims to show how technique provides the basis for material transformation within organizational production, acting as a mediating link between the generation of ideas and their realisation via technical means. This chapter will begin with a review of the relevant literature to better

understand technique, then present three dimensions –agencies, associations and artifice– which characterise its operations

3. TECHNIQUE

Introduction

The purpose of this chapter is to consider technique from a process perspective, and examine its operations with respect to the everyday activities which form organizational life. In chapter one, I argued that technique has been too readily overlooked, due to a misunderstanding of its relation to science and technological development (Bittner, 1983) and also due to the epistemic difficulties associated with technical knowledge (Gille, 1986). In the previous chapter, I presented an experimental methodology to help capture the ways in which technique contributes toward creative practice. In this chapter, I present the conceptual and empirical work which will allow for a reconsideration of technique from a process perspective.

I begin by discussing important contributions located within the fields of anthropology, philosophy and sociology that highlight the necessity of understanding technique and its place within social life. Next, I draw attention to process studies which have examined technical action, focusing specifically on works utilizing resources developed from Actor-Network Theory, such as action nets (Czarniawska, 2008), the communicative perspective developed by the Montreal school (Taylor and Roubichoud, 2004) and theories of sociomateriality (Orlikowski, 2007). Building on these contributions, I aim to show how technique provides the basis for material transformation within organizational production, acting as a mediating link between the generation of ideas and their realisation via technical means. To do so, three

dimensions of technique are presented, drawing upon process studies and the works of Bruno Latour (1994a, 2005b), Gilles Deleuze and Felix Guattari (2004) and Gilbert Simondon (2017).

The first is an expansion of the concept of agency to include both humans and non-humans. As techniques often function as a meeting point between people and things, it is necessary to replace the strict boundary separating the two with a broader understanding of how they are mutually implicated. The second -associations- considers how different agencies are organised to form the basis of production. Key to this processual view of organizing production is the stability offered by non-humans, particularly technical objects, which when coupled with the social intentions of humans can join to form a durable whole. The third –artifice– examines the intrigues which lie in the utilization of techniques towards particular organizational goals. Returning to the image of Daedalus and his bag of tricks (Latour, 1994a), this section considers the machinations and manoeuvres involved in allying human and non-human forces within production. These dimensions, when taken together, offer a way to consider technique from a process perspective. I conclude this chapter with some final comments on technique an overview of the main points discussed.

How other Disciplines Approach Technique

Before considering technique from a process perspective, it will be beneficial to examine how other disciplines have approached the issue, for as we shall discover, the challenges presented by technique are not limited to studies of organization. As scholars from a variety of fields have noted, technique forms an equally problematic object of inquiry, aptly captured, for example, by Pierre Ducassé's argument that

"Technique expects the philosopher to restore *at any time* its implicit conflictual, divisive, and problematic dimension" (2014, p.36). Alongside the shifting, uncertain nature of technique, fields such as anthropology, philosophy and sociology have also undertaken the broader challenges of accounting for human life in respect of technical progress and development (Mumford, 1934). Such questions have grown in prominence (and complexity) over the course of the twentieth century, particularly in light of technology's encroachment into the social, material and even spiritual areas of modern life (Mumford, 1934; Ellul, 1965; Heidegger, 1977).

We may begin however, with a return to the work of Henri Bergson, whose philosophy provides not only a suitable point of departure for process studies, but also for the present discussion on technique. Notably, Bergson argued that human life was characterised by a predisposition to act upon and organize matter, and coined the appellation *Homo faber* (in contrast to *Homo sapiens*) to capture this aspect of human activity. In line with his broader philosophy outlined in Creative Evolution (1944), Bergson considered "mechanical invention as a biological function, an aspect of the organization of matter by life" (Canguilhem, 1992, p.69). Whilst for Bergson all life proceeds through a creative process of organization (Linstead and Thanem, 2007), human action was distinguishable by the way tool use and creation were relatively undetermined (Ingold, 1986). This was thanks to the reflective capability of the maker to see the malleability of matter, which Bergson contrasted against the instinctive function of tool use found in other animals[1]. As a result, the process of mechanical invention and tool use marked a defining feature of human intelligence, which Bergson described as *"the faculty of manufacturing*

artificial objects, especially tools to make tools, and of indefinitely varying the manufacture" (1944, p.153-4, emphasis in original).

Bergson considered technique and technical invention as an extension of biological life, a view also shared by the anthropologist Marcel Mauss, who championed technique in an early attempt to rescue it from "that posting of ignorance: *Miscellaneous*" (1973, p.70). Mauss is primarily known in this area for his study on techniques of the human body, a work which Tim Ingold has often raised to criticise accounts which treat technique as "an inventory of instrumental objects together with their operational requirements" (2000, p.315). In Mauss's view, technique can be defined as "an action which is *effective* and *traditional*" (1973, p.75), and may refer to any number of strategies for activities such as swimming, listening, breathing and sleeping. With his definition, Mauss positioned techniques as an integration of biological and social action, made possible via the intentional technical acts of individuals (Wolff, 2010).

For Mauss, technique described a particular goal, "assembled for the individual not by himself alone but by all his education, by the whole society to which he belongs, in the place he occupies in it" (1973, p.76). Mauss' work focused predominantly on techniques of the body, which critically, appears to exclude external technical objects[2]. On the contrary, Mauss further develops his position by arguing that: "The body is man's first and most natural instrument. Or more accurately, not to speak of instruments, man's most natural technical object, and at the same time technical means, is his body" (p.75). This position opens the possibility for an *originary technicity* inherent to human activity (Derrida and Beardsworth, 1994; Stiegler, 1998), and was later developed in the work of Andre Leroi-Gourhan, a student of

Mauss, who, also inspired by Bergson (Stiegler, 1998) began with the idea of a universal technical *tendency* (Lemonnier, 1986) visible within human evolution.

Leroi-Gourhan's concept of a universal technical tendency sought to provide an explanation for techniques which evolved contemporaneously in different ethnic cultures (Audouze, 2002). As Naji and Douncy (2009) note, the originality of Leroi-Gourhan's work was in the author's conception of techniques from the dynamic perspective of a "dialectical relationship between materiality and performance" (p.412): a conception which Leroi-Gourhan utilised in order to classify techniques in terms of the action and material transformation involved. The underlying emphasis of this view was that all techniques were underpinned by a necessary coupling of humans and technical objects, particularly tools, acting as a key feature within the process of 'hominization'. Bernard Stiegler argues that for Leroi-Gourhan, it is the invention of the tool and the operational chains (*chaîne opératoire*) of human-tool relations that take precedence in human development, allowing humanity to essentially invent itself "by becoming exteriorized techno-logically" (1998, p.141), replacing biological functions with social and technical inventions.[3] Humans and tools are therefore intimately connected, developing together in what Marcia-Ann Dobres describes as "the processual unfolding of technique and technician" (1999, p.124)

This view of humans altering their surrounding environment, and in turn altering themselves, is also captured and further developed by Deleuze and Guattari's (2004) work on deterritorialization. Building on Leroi-Gourhan's descriptions of a technical tendency, the authors develop an image of a 'machinic phylum' -or technological lineage- which they define as a "*constellation of singularities, prolongable by certain*

operations, which converge…upon one or several assignable traits of expression" (2004, p.448, emphasis in original). These traits of expression are pervasive, for in a distinctly Bergsonian manner, Deleuze and Guattari consider life as "nothing more than a potential for expressions, productions and movements (Colebrook, 2006, p.11). Expressions can be realised through technical means, resulting in a deterritorialization or decoding (Rajchman, 2000; Massumi, 1992), in which new assemblages[4] are formed, and re-territorialized (or re-coded) into the envoirnment. Deterritorialization -via technical means- can therefore refer to any activity in which techniques cause a shift or transformation within existing networks, and can be found at work in – to take a few examples; the development of military technology (Deleuze and Guattari, 1980;2004) design practices (Lancione and Clegg, 2013) or in the case of Wikileaks (Munro, 2016).

Given the above descriptions of techniques and their influence on everyday life, it becomes clear that the commonly held divisions between technical and cultural matters may be problematic (Sterne, 2003; Mackenzie, 2005). However, such distinctions have not been formed by accident, particularly where technical objects and their assumed role within society are concerned. An early attempt to redress this issue can be found in the work of Gilbert Simondon, who argued that the error lay in treating culture as "a defense system against technics" (2017, p.15). Such a defence was held to be necessary due to the manner in which techniques and technical objects appeared to impact upon human life, particularly in relation to labour. Rather than maintaining this opposition, Simondon proposed a new technical culture, not to be advanced by science or economics but by "the existence of a technologist or *mechanologist*, alongside the psychologist and the sociologist" (p.19).

Simondon argued that the displacement of tool-bearing humans by machine operations (coupled with the manner in which they were incorporated into the labour process) was largely responsible for the modern antinomy between human and machine. What this perspective lacked, however, was an understanding of "the liberatory potential such a displacement may possess" (Combes, 2013, p.59). For Simondon, it was essential to recognise the different forms of technical becoming machines could make available. In the opening passages of *on the mode of existence of technical objects* (2017), Simondon offers the image of a conductor as a metaphor for these different possible technical relationships:

> Man is the permanent organizer of a society of technical objects that need him in the same way musicians in an orchestra need a conductor. The conductor can only direct the musicians because he plays the piece the same way they do, as intensely as they all do…he is the mutual interpreter of all of them in relation to one another…He is *among* the machines that operate with him (p.17-8).

For Simondon, the outcomes of techniques –technical objects– beget further developments, allowing for new forms of organization, in which the traditional roles of the human and the technical object may change. As Simondon was aware in post war France, and is certainly visible today, technical objects carry their own dynamism and hold their own positions within industrial production. Rather than treating technical objects as artifacts, Simondon sought to show their evolutionary trajectories, described as a process of concretization.[5] The challenge for Simondon, recognising these characteristics of technical objects was to develop a technical culture, or a new *technical mentality* (2012) in which "the distance between the inventor, the constructor, and the operator is reduced: the three types converge

towards the image of the technician, this time both intellectual and handy" (2012, p.10). This new way of thinking required that the same appreciation of techniques, found in ideas of craft and craftsmanship (Sennett, 2008), be applied to those techniques required to develop and operate within technical networks of post-industrialism.

Given its potential, one may also find negative accounts concerned with the influence of technique. One such reading of the role of technique can be found in the work of Jacques Ellul (1965), who defined technique as "the totality of methods rationally arrived at and having absolute efficiency (for a given stage of development) in every field of human activity" (Ellul, 1965, p. xxv). For Vanderburg (2012) Ellul's vision of technique can help explain "why our civilization succeeds spectacularly in terms of improving the performance of everything, and fails equally spectacularly in ensuring that the results are able to coevolve without undermining the integrality and integrity of the fabric of relations in which it participates" (p.184). Ellul ultimately considered the role of technique as contributing to the making of a "mass man" (Ellul, 1965, p.405) which, rather than altering technology to suit human needs, altered humanity (both voluntarily and involuntarily) to ensure a smooth integration (Driscoll and Weibe, 2007).

Similar concerns can be found in Heidegger's (1977) work, which, building upon an ontic definition of technology, sought to account for its essence, which Heidegger famously understood as "nothing technological" (1977, p.20). Heidegger instead envisaged the essence of technology as a mode of revealing or bringing-forth (*Poiesis*). Classically, technology held this character in revealing characteristics of the material world. However, in modern technology and the pursuit of development

for its own sake, Heidegger finds the mode of revealing has been altered into an enframing or challenging-forth (*Gestell*): “Enframing means the gathering together of that setting-upon which sets upon man, i.e., challenges him forth, to reveal the real, in the mode of ordering, as standing-reserve” (p.20) . In modern technology Heidegger sees a tool to reform the world as a standing-reserve (*Bestand*) or resource for production, which will inevitably take its producers with it. Bernard Stiegler, in his trilogy *Technics and Time* (1998, 2008, 2011) has further developed a Heideggerian perspective, considering the impact of exteriorization on consciousness, specifically in relation to the extension of memory (1998, 2008) and the disorientation brought about by industrial temporalities (2011).

A final important addition to these perspectives is the sociological input of Actor-Network Theory (hereafter referred to as ANT), which can be considered as the modern heir to many of the authors listed above (Law and Hassard, 1999; Harris, 2005; Riis, 2009; Harman, 2010; Schiølin, 2012). Resistant to a single definition, ANT is the term given to a body of work which has emerged from the interdisciplinary field of STS, which itself examined the influence of science and technology as forms of social practices, rather than as objective pursuits of knowledge (Law, 2008). Best known either as a sociology of translation (Callon, 1984), or as a type of material semiotics (Law and Mol, 1995; Law, 2009) ANT is primarily aimed at developing a common register for describing the roles of people and things (Latour, 2013), with a specific interest in the deployment of techniques (Latour, 1994a) and the related process of heterogeneous engineering (Law, 1987).

Familiar to French studies under the term *acteur-réseau*, Czarniawska (2017) attributes the entry of ANT into Anglo-Saxon scholarship to Michel Callon and

Bruno Latour's (1981) 'Unscrewing the Big Leviathan: Or How Do Actors Macrostructure Reality and How Sociologists Help Them To Do So'. In this work, Callon and Latour invoked Hobbes' image of the Leviathan to convey how Macro-Actors (such as innovations), though appearing to be solid and fixed, were actually constructed and held in place by a surprising variety of numerous different forces. In line with a process worldview, Callon and Latour argued that it was the act of constructing, rather than the finished product, with its "negotiations, conflicts, even wars" (Czarniawska, 2017, p.160) which sociologists should aim to uncover. This goal is aided by two ideas central to ANT. Firstly, the concept of "actants" –a term borrowed from the French semiotician Algirdas Greimas, which could be applied without discriminating between the type of actor involved (Czarniawska, 2017)– and secondly "translation" –a form of transformative movement originally proposed by Michel Serres (1982) to describe changes which carry something of the original and the new (Clegg, Kornberger and Rhodes, 2004). Notably, ANT has also drawn criticism, specifically for amounting to a "dissolution of humanity" (Latour, 1999a, p.16) in its equal treatment of humans and technical objects, alongside some more nuanced critiques which have looked unfavourably on the political aspects of ANT raised by feminist or postcolonial studies (Elam, 1999; Watson, 2011).

As these discussions from the related disciplines of philosophy, anthropology and sociology show, the concept of technique points toward a dynamism formed between human activity and technical objects, which raises important questions within organizations as a site of technical activity and development. To summarise briefly, Bergson, Mauss, Leroi-Gourhan and Deleuze and Guattari all develop an image in which technique underpins the ways in which humanity develops "by becoming

exteriorized techno-logically" (Stiegler, 1998, p.141), a process which in turn affects both the environment and the subject (Deleuze and Guattari, 2004). For authors such as Heidegger and Ellul, technique and modern technology present a threat to distinctly human aspects of existence. For Simondon and ANT scholars, we find a focus on the concretization of techniques into technical objects, which populate a shared environment and cannot therefore be overlooked. In each case, it can be said that technique is central to how humans shape and are shaped by the technical environment.

Technique and Process organization studies

Having discussed how other disciplines approach technique, I now return to process organization studies. Given the critical stance towards substantialism noted in chapter one, process studies naturally present a number of opportunities for the study of technique, and have also engaged fruitfully with many of the thinkers listed above, notably Deleuze and Guattari (Wood and Ferlie, 2003; Clegg, Kornberger and Rhodes, 2005; Linstead and Thanem, 2007; Kristensen, Lopdrup-Hjorth, Sørensen, 2014); Heidegger (Chia and Holt, 2006); Simondon (Styhre, 2010; Letiche and Moriceau, 2017) and Actor-Network Theorists (Chia, 1995; Cooren, 2005; Czarniawska, 2008; Hernes, 2008, 2010). Process Studies also have a rich history of engagement with the study of aesthetics (Strati, 1999; Linstead and Höpfl, 2000; Linstead, 2018; Guillet de Monthoux, Gustafsson and Sjöstrand, 2007) which in turn have approached technique from the related concepts of skill (Strati, 1985; Ingold, 2000) and craft[3] (Sennett, 2008; Taylor, 2012). For the purpose of this study I shall focus on process studies utilizing

ANT, which I consider to be the most widely known and utilized within organization studies considering technical activity.

As a notable contribution to process studies, arguments from ANT have formed an important part of Chia's process inspired plea for a postmodern science of organization (Chia, 1996) as well as Hernes' process theories of organization (2007, 2014a; Czarniawska and Hernes, 2005). Likewise, ANT has also proven to be a touchstone for empirical works developing process themes (Gherardi and Nicolini, 2000; Callon and Muniesa, 2005; Steen, Coopmans and Whyte, 2006; Lancione and Clegg, 2013).

As mentioned previously, it must also be recognised that ANT has also been the subject of significant criticism and attempted reformation (Maclean and Hassard, 2004; Whittle and Spicer, 2008; Czarniawska, 2008; Ingold, 2008, 2012). How then, should ANT –"a wild and creative theoretical tradition" echoing that of Simondon, Leroi-Gourhan and Deleuze and Guattari, but also "a term that stopped working a long time ago" (Mol, 2010, p.254) – be best utilised? One solution, adopted by process scholars who value its resources, has been to home in on specific elements of ANT's diverse approach to help mete out alternatives in response to the critiques levelled against it.

The first drawing on ANT's original propositions is Barbara Czarniawska's action nets (2004, 2008), which represent her own approach to exploring the processes of organizing. Czarniawska defines an action net as "a compromise devised to embrace both the anti-essentialist aspect of all organizing (organizing never stops) and its apparently solid effects" (2004, p.780). Czarniawska takes inspiration from two bodies of theory, drawing upon ANT and neo-institutional theory (Powell and DiMaggio,

1991), with the latter providing insight into the symbolic domain of "ideal images" (Czarniawska, 2008, p.18) which help create institutional order. Czarniawska also points to the repetition of collective action in light of these images as a suitable explanation for the apparent solidity of organizations (2008, p.22) and describes her theory as an attempt "to combine verb and noun in order to emphasise the fact that while we studying organizing, we tend to encounter many a successful product of such earlier organizing processes: namely, organizations" (2008, p.16).

As one would imagine, the action nets themselves are depicted as connecting threads representing different actors which form the organization. Czarniawska indicates that the purpose of the theory is primarily to guide research, arguing that study of action nets "means answering a dual question: what is being done, and how does this connect to other things that are being done in the same context?"(2004, p.784) Of particular importance to the formation and stability of action nets are technical objects, which, adopting language common to ANT, considers institutions as 'inscribed' within technical objects. Further work has been carried out by scholars who have examined in further detail how action nets are formed (or 'knotted'; Lindberg and Czarniawska, 2006) and the role of boundary objects within action nets (Lindberg and Walter, 2012).

A second perspective which develops a process worldview and draws fruitfully upon ANT's resources is the communicative perspective developed by the Montreal school (Cooren and Taylor, 1997; Taylor 2001; Taylor and Roubichoud, 2004). For its proponents, attention is drawn to the dynamics of communication, which they argue are connected "to the very processes, activities, and practices that constitute organizations or organizational phenomena" (Cooren, Vaara, Langely and Tsoukas, 2014, p.2). Paying attention to this constitutive role of communication leads research

towards the role of the performative capacity of speech and text. Taylor and Roubichoud (2004) for example, argue that discourse (defined as larger patterns of talk (2004, p.399)) can be fruitfully understood as supporting the process of organizing in two ways. The first, the authors suggest, is through the production of texts, which organizational actors use to help make sense and maintain organizational practices, once again relying on actions being inscribed in technical objects. The second is in the form of conversation, the purpose of which is "to establish a basis of action and to maintain the coordination of members of the organization in responding to a mixed material and social environment" (p.397). Conversation, is therefore a social and material process which underpins the everyday acts of organizing previously described by Czarniawska. In particular, it is the transactional effects of the conversation, from which neither party emerges unaltered (Taylor, 2014) which is important. As this process can take place between a variety of different actors, such as in relation to technical objects such as texts, the capacity to effect a process goes beyond the normal perspective of intentional human action (Cooren, 2004).

The final process perspective I wish to highlight is found in recent discussions on sociomateriality (Orlikowski and Scott, 2008, 2013; Leonardi, 2013), which also borrow from ANT's resources. Emerging from studies into information systems within organizations, sociomateriality is centred on the premise that "the social and the material are considered to be inextricably related — there is no social that is not also material, and no material that is not also social" (Orlikowski, 2007, p.1437). Developed from prior research into the role and increasing reliance upon technology in organizations (Orlikowski, 1992) as well as elements of ANT and Karen Barad's

Agential Realism (2003), theories of sociomateriality argue for a relational understanding of technology.

Orlikowski's (2010) work argues for example, that within management research, technology and its uses has broadly fallen into three groups. The first is the study of technology as an *absent presence*, which draws attention to the fact that for the vast majority of organizational studies, "technological artifacts (and materiality more generally) tend to disappear into the background and become taken for granted" (p.4). Where technology is considered, it is theorised (secondly) as an *exogenous force*, in which the organizational hardware of new technology is held to drive forward organizational change. Thirdly, technology and its uses are considered as an *emergent process* which places technology in the context of different human histories and choices. Although this third view can be argued to lean heavily upon a process viewpoint (particularly in contrast to theory building based on variances, see Mohr, 1982), all three are deemed by Orlikowski to rely upon an "ontology of separateness" (2010, p.10) in which the focus is divided between material things on one hand and social actions on the other. In contrast to this, Orlikowski proposes a relational ontology, which focuses instead on the "constitutive entanglements (e.g., configurations, networks, associations, mangles, assemblages, etc.) of humans and technologies" (2010, p.11). Theories of sociomateriality are indebted to the insistence in ANT that technical objects are recognised as connected to human action, providing the material infrastructure for social action.

In comparing these process theories to the approaches to technique described previously, similar themes become apparent. The underlying processual emphasis on change over stability is a common point of reference for both process studies seeking

to uncover the dynamics of organizing, and of the previous theories of technique, which sought to describe the performative aspects of technical change. That the social and the material should to be considered as connected hold much in common with the "dialectical relationship between materiality and performance" (Naji and Douncy, 2009, p.412) described by Leroi-Gourhan, and Deleuze and Guattari's (2004) work on deterritorialization. Building on these connections, I propose that a process view of technique can benefit from the resources provided by ANT, but, like the studies above, must also recognise its limitations if it is retain its potential vibrancy as a resource for future studies, and help it avoid "materializing as another fixed strategy" (Neyland, 2006, p.42) within social theory and research.

The Dimensions of Technique

In the following section I present three dimensions of technique –agencies, associations and artifice–which capture its operations. In doing so, I have deliberately sought to avoid any attempt at classifying or grouping techniques by either the type of material or process involved. Instead, each dimension acts as a way of orientating, or directing understanding toward a particular facet of experience: namely, the inherently technical nature of organizational life as found through the proliferation and utilisation of technique. Both Gilbert Simondon (2017) and Bruno Latour (2013) consider technical activity as a 'mode of existence', a term which recognises that although existence is not solely technical, technicity can always be found wherever one chooses to look. For the purposes of process organization theory, I would like to suggest something similar and say that whilst it would be reductive to equate organizations to technique, technique nevertheless forms a part of all acts of organizing.

Throughout the following sections, empirical material from the Atlas and Helios studies will be presented to explore how these three dimensions are revealed in practice. Many of the techniques discussed involve technical objects; however, I do not wish this theory to be considered as exclusive of activities where none appear to be immediately present, as such activities can still be considered as matters of technique.[7] I begin by considering how best to understand the relational nature of techniques, which act as a meeting point between people and things. This leads to a discussion on the different agencies involved in technique, and how best to consider their workings in practice. I then consider how these different agencies are organised to form the basis of production. Key to this process of organizing production is the stability offered by technical objects, which when coupled with the social intentions of humans can join to form a durable whole. Finally, I examine the intrigues which lie in the utilization of techniques towards particular organizational goals. Taken together, analysis of these three dimensions can form the basis for the study of technique in organizations.

Agencies

In reviewing process organization studies, I have already noted that both antecedent theories of technique and studies drawing upon ANT share a common focus on relationality (Cobb. 2007; Orlikowski 2010; Hernes, 2014b). This relational character is however, an area which has previously led to some of the most trenchant critiques of ANT. How then, should the relational character of techniques be best understood? If techniques, as Alfred Gell wrote, "form a bridge, sometimes only a simple one, sometimes a very complicated one, between a set of 'given' elements" (1988, p.6), then to whom (or what) do they ultimately belong? And if this question

cannot be answered in a satisfactory manner, what does that tell us about technique? To fully address this issue, it is necessary to consider the constituent parts of technique in terms of their related capacities to act upon or effect a given situation; or, in other words, to consider the question of *agency* when dealing with its workings.

Agency, in its simplest form, refers to a "capacity, condition, or state of acting or of exerting power" (Cooren, 2015, p.475). Primarily directed towards human activity, it is associated with concerns of intentionality, free will, creativity and self-hood (Emirbayer and Mische, 1996). It has been argued with increasing regularity, however, that this strict focus on human activity undermines other entities which also populate and influence organizational life (Miettinen, 1996; Engestrom and Blackler, 2005; Cooren, 2006; Czarniawska, 2008), thereby excluding the possibility for other dynamic accounts of materialism and technical activity (Bennett, 2010; Deleuze and Guattari, 2004) to emerge. Such accounts suggest that whilst descriptions of action are often centred upon the wilful interventions of individuals, a closer examination reveals a variety of other forces and actors required to secure and maintain such activity (Latour, 1984; Barad, 1998; Mol, 2010). This issue is particularly pertinent to technique, which has been premised upon such interactions between humans and the surrounding technical environment. For Simondon and Gille, these environmental conditions are recognised as a system of 'technical ensembles': for Leroi-Gourhan, the technical tendency is made visible in the exterior milieu through the establishment of 'technical facts'. Both are held to influence ongoing activity and development. It would be a mistake, then, to hastily separate technical objects such as programs, tools,

machines and materials from human action within an analysis of technique; but does their inclusion necessarily entail parity between people and things?

To answer this question, let us be clear on exactly how the concept of agency is extended beyond the capacities of intentional humans. François Cooren, who has rigorously developed this perspective within organization studies (Cooren, 2004, 2006, 2015; Castor and Cooren, 2006; Bencherki and Cooren, 2011; Caronia and Cooren, 2014) argues that where something is held to act upon or influence a given state, it can be said to exhibit a quality of agency. Cooren (2015) offers the example of an acid, which, upon contact with various types of metal will react, resulting in corrosion or decomposition. The acid is therefore held to display agency, making a difference and "exerting a form of power" (p.475) upon the metals it comes into contact with. Few are likely to disagree with this definition, as one could point to various examples of this movement which occur autonomously in nature (see Delanda, 1992, for an account of such non-organic activity). The difficulty arises, however, when such forces are brought to bear upon human activity. Consider Cooren's (2015) case of a contract drawn up by a lawyer. In one sense, the contract represents the actions and intentions of the lawyer, who uses the contract to describe or enforce certain conditions. The lawyer, then, is "the ventriloquist and the contract is the *dummy* or *figure*" (p.476), who enacts the commands laid out. Yet this process also works both ways. The contract may also hold or constrain the lawyer to certain actions, as it "can be positioned in such a way that *it* makes *the lawyer* say specific things (e.g., that her client is entitled to compensation for a breach of agreement)" (p.476). Cooren suggests that a form of textual agency is therefore at work, alongside the lawyer's intentions, from which neither party emerges unscathed or unaffected. Are both the contract and

the lawyer, then to be considered as displaying agency? Cooren's resulting position is that action "is always something that is shared by others: Faire, c'est faire faire (to do is causing to do)" (2006, p.85, see also Latour, 1994b). Formed by these actions, the organization is considered a hybrid phenomenon, which "mobilize[s] the participation of entities with variable ontologies (material, discursive, human, non-human)" (2006, p.82) as suggested by the process accounts discussed previously.

When considering technique, an equivalent form of hybridity is present, alongside a similar problem on how the different forms of agency which sustain it should be treated. In the Atlas and Helios studios, techniques played a central role in the organization and production of design works, entailing engagements with these different forms of agency. Whilst it is true that the particular techniques found in design studios are not different in kind to those found anywhere else, the process of production does offer an opportunity for different agencies to be recognised or problematized in a manner which is not always straightforward with finished items. Indeed, as the character of much of the items which furnish contemporary life are often convenient, ergonomic, and unnoticed (Flusser, 1999; Anusas and Ingold, 2013), the unfinished nature of production presents an important location for such enquiries. Armed with an understanding of the different possible types of agency in mind, then, let us consider how they contribute towards technique within the Atlas and Helios studios.

Much of what was undertaken in both studios relied upon different tools and machines, such as the sewing machines in the Atlas studio, which Rachel had begun to experiment with, hoping to produce a new design for a dress she had been developing:

[*In the Atlas Studio, I am present with Rachel, a designer. We have moved to the far right corner of the studio to a grouping of four sewing machines. Rachel is exploring techniques to make a new dress, using a purple, silk-like material with a pattern of flowers.*]

Armed with two panels of the patterned material, Rachel is ready to begin the process of sewing them together. To do so, we move to a small row of sewing machines in the corner of the Atlas studio, and Rachel begins to make the necessary preparations:

> **Rachel**: *I think we're okay, I might just have to go for it, see if it works*

Placing two off-cuts of material beneath the needle, Rachel presses on the pedal and the machine begins to whirr and click, the needle rapidly forming the stitches as she pushes the material along the machine bed. Unhappy, Rachel stops abruptly and turns her attention to the tension of the thread:

> **Rachel:** *I'm adjusting it a bit.* (Rachel turns from the machine to the dress panels) *So what I'm doing with the dress just now is I'm doing this on all of the edges to stop it from fraying, and then I'll sew them all together. So I'm just going to go round the whole piece.*

Rachel then inspects the stitches on the off cut material. Dissatisfied with the result, she turns back to examine the tension of the thread:

> **Rachel:** *I don't really know what I'm looking for, I mean you can usually tell if it's really bad, if it's quite loose…*
>
> **Rory:** *yeah*
>
> **Rachel:** *I'm going to see if I've got any more scraps, to test it…*

Rachel continues to prepare the machine (fig.3), and experiment with off cuts of material:

Rachel: *yeah they've gone very tight so something must be quite tight, I'm just going to untighten these two* (Rachel adjusts the regulators) *or maybe it's just this material that's like bunching up, you shouldn't*…(turns knobs again)

Rory: *Its nothing to do with the speed?* I ask,

Rachel: *you can change the speed; generally it will do the same thing*

Rachel then explains the operation of the pedal beneath the table which controls the acceleration of the needle, before highlighting the different types and thicknesses of thread. She continues to adjust the machine (fig.4), and when satisfied with the stitches being produced, she declares:

Rachel: *I think that looks okay. You just don't want the stich to come undone*

Rachel and I discuss the hem and whether the stitches will be on show on the finished product. Rachel complains that the process isn't very exciting, but is now happy with the stitches and can proceed to the dress itself. Reflecting on Rachel's experience with the machine and dress making in general I ask:

Rory: *so I suppose these are your early creations, aren't they?*

Rachel: *yeah*

Rory: *do you think you have your own style?*

Rachel: *not really, it's mostly little things I'm sort of copying, some of them I've created just to experiment with, it's mostly just experimenting to see what I can do with a sowing machine and practicing different techniques. (Rachel returns her attention to machine) But yeah, very early on*

Figure 3: Rachel preparing the sewing machine

Figure 4: Rachel adjusting the sewing machine

Rory: *The thing is with the stuff in here you could spend years just being really good in one area?* I suggest

Rachel: *Exactly! I like doing lots of different things, I guess, (Rachel lifts her foot lightly off the pedal as she speaks, the machine slows, but does not immediately stop) I'm not great at any one thing, I'm just trying out lots of different things…*

Technique, as the example illustrates, is a matter of relations between different agencies, the effect of the foot pressing against the pedal and the hand guiding the needle. The technical objects mobilised in this example, the sewing machine, the scrap material, and the thread, are as important to understanding the action as Rachel, her skills, and her intentions. When the action occurs, it is the relation which achieves the effect (Law, 1987). For Deleuze and Guattari (2004), this sort of action is indicative of the aforementioned *assemblage* of different forces, arguing we should not make the mistake of "considering tools in isolation: tools exist only in relation to the interminglings they make possible or that make them possible…a society is defined by its amalgamations, not by its tools"(p.99-100). If the different agencies are separated – for example, if the foot comes off the pedal – then the effect no longer occurs.

Indeed, as the process is occurring, one may ask from the viewpoint of technique whether the sewing machine and its user are separated at all. Whilst the presence of human agency here is important, it is equally critical to recognise that within technique other forces are also present and effective (Cooren, 2006; Czarniwska, 2008). To strip back such technical forces reveals the extent of their influence. Should Rachel have proceeded without the aid of the sewing machine and completed the work by needle,

the time taken would increase substantially. Should any form of tool be removed completely, Rachel would not be able to complete the design at all. In the sewing machine and the needle, we therefore find relations which may associate with or substitute human capacities (Latour, 1984; 1992).

The difficulty in coming to terms with this influence of non-human agency appears to be the assumption that such extensions lessen human intentionality, and as a result, opportunities for political intervention (Collins and Yearly, 1992; Latour, 1999a). It is interesting to note on this point that whilst Latour's work is widely praised for its treatment of technical objects, it is the denial of any human exceptionalism through his use of the term "actant", and the insistence of symmetrical[8] relations between humans and non-humans that often draws the particular ire of his critics (Mutch, 2002; Vandenberge, 2002). Less often recognised is the fact that Latour's work actually accommodates a reformed humanism, which the author contends has historically been an unnecessary victim of reduction; that "[b]y seeking to isolate its form from those it churns together, one does not defend humanism, one loses it" (1993, p.137). Similarly, Cooren argues that "recognizing that other beings do things does not imply *depriving* humans of their agency. Human beings invent artifacts, machines, and so on precisely because they know that these objects will do things they are often unable to do themselves" (Cooren, 2015, p.475-6). For Cooren and Latour humans may not be privileged, but it does not follow that they are the same in kind as other agencies. Instead, Latour suggests that if we are to speak of "*Anthropomorphic*" theories, we should focus less on the *Anthropos* and pay more attention to the "*morphic*"; "the place where technomorphisms, zoomorphisms, phusimorphisms, ideomorphisms, theomorphisms, sociomorphisms,

psychomorphisms, all come together" (1993, p.137). For Latour, to be human is to be "a weaver of morphisms" (p.137), and humanity -like the figure of Daedalus in his workshop- emerges from these hybrid relations. If we accept this position, it becomes clear that technique requires a consideration of the relations between active humans and active objects (Rennstam, 2012) and their capacity to influence and shape each other (Knorr-Cetina, 1999).

Armed with this view, we can more clearly evaluate how this reformed humanism fits into a theory of technique. Skills, traits, and tacit capabilities may all be appropriate to the *Anthropos*, but typically exclude or relegate techniques to the periphery, leaving no opportunity for us to consider the *morphic*. The interest from ANT scholars in scientists, engineers, artisans and their workplaces is crucial not then, because they are is necessarily interested in innovation or innovators as traditionally understood, but rather because they provide an ideal location to make issues of technique visible. As weavers of morphisms, these professionals all openly undertake their role as mediators, enlisting different agencies to achieve their aims. To this list I will add designers, who, like the other roles above, and as argued from a process perspective, find themselves in between, rather than above, different agencies (Cooren, 2006). In the Atlas and Helios studios, this feature became apparent in their descriptions of their roles:

> **Simon:** "*My role as a designer, I think, is to add value. I think that's basically what we do, we don't create the content, we take the stuff we're given and we present it in the right way, certainly in graphic design anyway. I think in other disciplines you may be given the role as the actual creator but in graphic design you're more of a kind of catalyst, or a mediator, sort of like a … something that adds value to something, to the thing that's already there.*

If the thing isn't good there's only so far you can go for example, if the product isn't good there's only so far you can go with the graphic design for promoting that product."

Simon's description is noteworthy for a number of reasons. Firstly, he does not recognise himself as a creator taking full credit for what is produced. This is not to say that Simon does not consider himself or his activities as creative, as we shall discover later, but rather that he recognises his position in relation to other influences, and therefore only claims a part of the responsibility. In this respect Simon sees himself as a catalyst; something that can alter or improve a process as a source of change. The dependency on the character and qualities of the product itself is also notable. This particular explanation of his activities is striking both in its distance from the instrumentalist image of the individual creator, traditionally responsible for "the imposition of a form consciously planned onto shapeless matter" (Latour, 1994a, p.53) and in its acceptance of other factors influencing the design process. Other designers in the Helios studio also adopted this sort of logic, eschewing descriptions of their personal traits, preferring to position themselves within a wider framework of different agencies:

James: (having been asked to describe his role as a designer): *Hmm, at its simplest, I suppose, it's taking information and interpreting it in a way that you can re-purpose for people to consume that information. So you're explaining things to people, you know, you're taking ideas, concepts, you're taking emotions and all that kind of stuff and you're trying to, I suppose it's psychology in a lot of ways, you're trying to work out what would make somebody stop and look at this thing, or pick this thing up and engage with this thing, and for that thing to be as successful as it can possibly be, so, I think that's the thing, it's about presenting information, in its purest form.*

***

> **Jenny:** *Okay, so design is all about communication, so it's about taking content and making it communicate in a way which is appropriate for a setting, so you know, visually presenting something for grabbing someone's attention, making things easier to understand, specifically thinking of Helios, I'm thinking of the data translation stuff that we do, map visualisation, that kind of stuff, making stuff, presenting it in a certain way that gives it a specific feeling, a specific tone, that's what we do when we develop a brand, it applies across a number of different things but, its designed in a certain way to have a different kind of effect. That kind of thing…*

In James's and Jenny's conception, the role of the graphic designer is to steer the direction of information and communication, to take a product or a concept and re-shape it to increase its appeal. As Cooren (2006) argues, action is located in active engagement between these different humans and non-humans, between the *taking* of the content and *making* it communicate. To do so, the designer must navigate multiple agencies, and amongst these descriptions we may identify the product itself (visual, textual), its intended audience (social), the client who has paid for the work (individual, and likely with their own ideals) and the tools (technical) which will be required to achieve a desired outcome. Managing these different aspects is unlikely to be straightforward, and design, as Howard's opinion suggests, can be as much a case of problem solving as creating:

> **Howard:** *I guess it's kind of a tired trope but I think the most obvious role of a designer is that of a problem solver, as opposed to say an artist, who I think is someone who is more of a constructor, someone who asks questions. It's kind of the role of the designer to fix that shit, that's broadly speaking, obviously. I think there's different degrees of each on a curve, I think you can*

be a designer who causes more problems than you solve and that can actually be a good thing…

The suggestion that the designer is not wholly in control of the content, as raised by Simon and by Howard in comparison with an artist, raises an interesting distinction. Although the designer and the artist both share concerns for creativity, aesthetics and communication, the designer must connect, whereas the artist is perceived as someone who can afford to possess autonomy. Rather than distinguishing types, or attempting to delimit the practices of the artist from the designer, it is more productive to consider these perspectives in the context of the techniques and technical objects which have created them. As Lucy Suchman argues, the objects found within the design process are "fraught with significance for the relations that they materialise" (2005, p.379) and are therefore tied to different commitments for the artist than for the designer. This is perhaps unsurprising: such views of the designer's techniques as being somewhere between artistic human expression and technical implementation were also recognised by the clients, as Simon lamented:

Simon: *I don't know, maybe its tools…maybe it's the fact that…*

Rory: *What do you mean tools?*

Simon: *well because there's the impression that graphic design is easy because software does it, maybe it's this idea that you don't need a plan, you can just throw things together, you just need to… like graphic design, if graphic design is how it looks then surely you just need to put things on the page and just, maybe people wouldn't put in the same thought into what colour it is, they'd just pick a colour and that's you, but…*

Simon's complaint is well founded. As different agencies with different capabilities are mobilized within techniques, action is supported and substituted by technical

objects. Yet this process does not take place within a vacuum, and this delegation to different forms of agency does not pass unnoticed by the client. In this case the advances in digital design software have afforded more responsibility to the computer than it would have traditionally held. Latour (1993) has argued that the increasing visibility of such hybrid forms presents exactly this sort of challenge to the distinction of intentional subjects on the one hand, and inert objects of the other. The resulting controversy then takes place between the designer, who has to rearticulate their value, and the client or audience, who can secure a better deal if machines are deemed to hold more responsibility for the work being undertaken. Needless to say, the latter position offers little appeal to the designers:

> **Frank:** *it's because it's done on a computer man, clients think you can just push a button and make shit happen, do you know what I mean? Whereas art doesn't happen like that. Or writing doesn't happen like that.*

Such issues are undoubtedly taxing for the designers, but they are also indicative of a blurring between the commonly held properties and responsibilities of human and technical objects, and reveal a more fluid relationship between the two. Although techniques are commonly thought of as concerning the changing material environment by human hands, the reciprocal effect or implication for subjectivity is rarely given the same treatment. Yet as the designer's descriptions of their role highlights, little can be understood without also considering the impact of other non-human agencies upon human action. Latour (1994a) describes this aspect of technique as a *swapping of properties*, highlighting the movements that occur when different agencies are brought together and impact upon one another. To use his own example, "[y]ou are different with a gun in hand; the gun is different with you

holding it. You are another subject because you hold the gun; the gun is another object because it has entered into a relationship with you" (1994a, p.33). This argument, foreshadowed by Simondon's accounts of individuation (1992; Letiche and Moriceau, 2017) and the influence on relations between humans and technical objects (Simondon, 2017) can also be found in Deleuzian theories which take emphasis away from the subject toward an ongoing process of 'subjectification' (Deleuze and Guattari, 2004; Massumi, 1992; Hjorth, 2013).

Key to Latour's swapping of properties is that it is not simply applied to objects, for if "we try to understand techniques while assuming that the psychological capacity of humans is forever fixed, we will not succeed in understanding how techniques are created nor even how they are used" (1994a, p.32). This exchange was visible in descriptions provided by Ryan, who, when asked about the skills required to operate a laser cutter (some members in the Atlas studio seemed to be particularly proficient with this particular machine) responded:

> ***Ryan:*** *there is a logical process through going through machines, you know what you need to set up for yourself for the machine to understand you, what needs to be the safeguards on the machine cause you'll hurt it, and a lot of the time you experiment with the material enough to be able to see it, and you learn from your mistakes more than anything with these kind of things.*

Whilst we are accustomed to understanding machine operation as a series of set responses or steps, as represented in a typical instruction manual (Suchman, 2007; Ingold, 2000) Ryan's emotive descriptions also point to something which is not captured by such representations, pointing instead to a more engaged relation or "material consciousness" , to use Sennett's (2008) terminology. Both Ryan and the machine have to contend with the variability of the material, and alongside his

morphic description of the machine's operation (it needs to understand you, care must be taken not to hurt it), Ryan also needs to understand the machine well enough to predict or "see" how it react with certain materials. These techniques, requiring the user to think through or with the machine, were also found in the Helios studio. Designers often blurred the distinctions between the different technologies and their own responsibilities whilst working, indicating a swapping of properties between the two. Frank, in particular, discussed the value in using a computer to think through his process and help organise the different possibilities when developing a new design:

> ***Frank:*** *I guess, so use, kind of using folders in the computer like you use your brain I suppose, if you're formulating ideas, you throw out the shit ones, keep the good ones, kind of organise them by using folders in the computer in the same way, I'll start concept 1, concept 2, concept 3, then I'll add another folder in, another I'll go back to, and eventually out of all these files and folders, I'll have one final with the great idea in it, so I can always kind of go back, I guess that's the way I do it man…*

In this example, a swapping of properties with machines entails an exteriorisation of memory, a 'mnémotechnique', with ideas stored, organised and accessed through the computer (Harris, 2005; See also Stiegler, 1998). Through this swapping of properties, techniques effectively deterritorialize human sense and allow it to expand in different directions (Deleuze and Guattari, 2004). Ryan, having experience of the machine, can interpret its requirements; Frank is able to expand and organise his faculties to both record and re-present his ideas. In their own analysis of the process of deterritorialization, Deleuze and Guattari provide the example of the hand, which, when coupled with tools, extends its reach and capability into the environment. The hand, they argue, "must not be thought of simply as an organ, but instead as a coding

(a digital code), a dynamic structuration, a dynamic formation" (2004, p.68). Within either case, however, it is only in relation to the particular technical object (the tool, the laser cutter, the computer) that such extended perceptions make sense. Johnston (1999), drawing on Deleuze and Guattari, describes such expansion as a form of 'machinic vision', "a field of decoded perceptions that, whether or not produced by or issuing from these machines, assume their full intelligibility only in relation to them" (p.27). In this way techniques connect with different types of agency, blurring our ability to say to whom specific properties or responsibilities belong.

The idea of human and non-human actors swapping properties in this way provides a lens to look at agency beyond simply stating that different agencies are present, moving instead towards an understanding of how they contribute to the transformations found within production and, broadly, the process of becoming via technical means, challenging ideas of individual action (Simondon, 1992; Deleuze and Guattari, 2004). The swapping of properties between different human and non-human agencies also highlights the importance of technical choice, as well as the effects such choices have on action. It is these choices which result in the vast array of techniques, ranging from those relying heavily upon human ability, to those which attempt to augment or even replace it. From the process perspective articulated thus far however, this does not entail a dominating or deterministic character of modern technology; only a profusion of techniques, or a proliferation of hybrids (Latour, 1993), different assemblages which may enrol or displace humans and non-humans alike. On this point, it is important recall works which look negatively upon technique as encouraging worst tendencies of modern technology, notably Ellul[9] and Heidegger. In both cases, it is only an unwillingness to see both the potential in

technical development (and the distinctly human hand behind technical intrusions) that limit an understanding of technique. As Latour writes: “Heidegger is no Daedalus: he sees no mediation, no letting go, no stepping aside, no poesis in the technical world, only intermediaries, a terrifying kind of intermediary, eating away at the artisan and the engineer” (1994a, p.41). In the descriptions provided thus far, it is clear to see that rather than being eaten away, designers in the Altas and Helios studies are both taking advantage of (and occasionally taken advantage by) the morpic opportunities offered by different technical choices.

Such technical choices, and the different agencies they engage, explain why such a diverse range of techniques continue to propagate. Far from a homogenous view of technical progress heading toward automation, techniques explain why designers may turn to different technical objects at different stages in the design process, as Frank describes:

> **Frank:** *I started doing a typeface this week, so I thought “right, I’m not going to piss about in illustrator, I’m going to just draw it. I mean, we spoke about that, I don’t normally do that but it was just the kind of typeface it was, it really helped, it felt really nice to do that, and then just have the drawings in front of me, knowing what to do, and then sit and do that. So I suppose sometimes, if the programs are acting up, too slow, I just tend to get up and walk away man.*

The software, contrasted with pen and paper, offers a different form of engagement within the design process, and draws our attention to the potential effects different agencies offer to the designer and their potentially unexamined side-effects (Suchman, 2005). The question here then, when technique is framed as a swapping of properties amongst different agencies, is which elements allow programs of action

to be achieved and which hamper their development. For Frank, on this occasion, his own conclusion was as follows:

> **Frank:** *I think a lot of the time what a computer does is give you quick fixes, to some problems. And I think it maybe just takes a bit of the soul away man, from the actual creativity you know, rips a wee bit of that out man, and I do agree with you, it's an amazing tool, but that's all it is at the end of the day, you know, it's not generating ideas.*

From the viewpoint of technique, the first thing to consider is the different elements at work and their relation to one another (Gell, 1988). This leads to the question of agency, and how different agencies should be understood as contributing to a given outcome. I have suggested in this section that rather than simply stating that different agencies are present, or arguing about their status *a priori*, the idea of swapping properties can be used to consider how different agencies are engaged, and how agents are affected in doing so. This provides a more processual view of agency by turning the focus to how they become relevant in action, and opens up practical questions around the choices involved.

Associations

Having established that technique involves the swapping of properties amongst different agencies, I now turn to consider their organization, or how the ordering of humans and non-humans successfully holds things together. In this section, I consider the durability which can be achieved through the ordering and maintenance of different agencies, before returning to Latour's concept of association (1984,

1992, 2005b) to examine the effects that even seemingly minor changes can have upon this hard won stability.

By way of an introduction to these issues, I would like to return to a point raised within earlier approaches to the study of technique. As noted by the historian Bertrand Gille (1986), a single technique can be difficult to isolate, formed as they are of other techniques or, at the very least, a composite of energy and matter. It is therefore entirely sensible, as Gille proposes, to treat techniques as structures operating within larger technical ensembles, which are themselves often replete with technical objects (Gille, 1986; Stiegler, 1998). What I wish to draw attention to is the status of such objects, and how they form the infrastructure of everyday organizational life. Whilst technical objects are in one sense the output of techniques, care must be taken not to treat them solely as the outcomes of human action, as products of a *fabricational intention* (Combes, 2013). By this I mean that technical objects, with their own agentic capacity, possess their own influence on production and its organization. Pascal Chabot, drawing upon Simondon further distinguishes this feature, arguing that "[o]nce in operation, the technical object frees itself from its inventor, its superabundant functionality separates it from any plans or intentions projected on to it. The object acquires a concrete character, an internal coherence" (2013, p.15). This concrete character is well understood by Latour, who has argued on numerous occasions that although technical objects may reflect social constructions of cultural meaning and values, such constructions are themselves dependant on the inhuman properties lent to them by technical objects (Latour, 1990b, 1992, 2005b). His dictum that *technology is society made durable* (Latour, 1990b) expresses exactly this, as it is the solidity of technical objects which provide

the infrastructure for social relations, holding them in place. So, whilst we can rightly point to the different agencies at play within specific techniques, it should also be recognised that many techniques are themselves ordered in particular ways, and provide an entry point to the broader organization of human and non-human activity.

From the perspective of technique, what is described as 'social' is a composite of human and non-human agencies, which have been ordered in certain ways, despite attempts to explain it otherwise in other sociological accounts of action (Latour, 2005b). For this reason, and as I have argued in the introductory section, concepts such as 'organization' or 'institution' should be treated with a degree of caution. When they are invoked, a great risk often lies in mistaking the consequence of forces as their cause, or confusing the explanans with the explanandum (Latour, 2005b; Czarniawska, 2008). This is perhaps most readily visible in descriptions of 'social ties' (Latour, 2005b, p67), which are often said to be durable because of the strength of norms, customs or laws, without ever explaining what exactly provides these with their durable capacity in the first place. If one takes this to be case, and attempts to isolate these 'social factors' from their immediate context, they run the risk of attempting to explain such features as effects of a broader society. This line of thinking ultimately ends up with the tautological explanation that social ties are an effect of society and vice versa, where the social explains the social, ignoring the non-human agencies which enable it to persist. Rather, within societies, organizations and institutions we find a "loci of methods of ordering, whose essential operation resides in the recurrent patterns by which the relations between humans (subjects) and nonhumans (objects) are generated and maintained" (Harris, 2005, p.165; Hernes, 2010). An early iteration of this view can be found in Simondon's

concept of the 'associated milieu', which acted as a mediating function "between technical, fabricated elements and natural elements, at the heart of which the technical being functions" (2017, p.59). Having recognised these human and non-human agencies within techniques, it is then important to recognise the associations between them, account for their ordering, the different shapes which form a "fabric…that offer[s] the possibility of holding society together as a durable whole" (Latour, 1990, p.103).

In the Atlas and Helios studios, the ordering (and reordering) of human and non-human ties provided a constant backdrop to daily activity. Aside from the particular techniques relevant to their role as designers (which I shall explore in chapter five), it was also clear to see that the techniques for ordering design activities equally relied on particular chains of different actors. Take for example, the weekly planning meeting in the Helios studio, in which the team where briefed on the status of existing works and new business. In the excerpt below, Simon is filling the other members in on the progress with the T1 video, a piece of work for the company Athens, which is also being assisted by a subcontractor;

[*In the Helios Studio, the team have gathered for a morning briefing to discuss the development of ongoing projects and how their work is to be organized that week*]

> **Simon:** *We've got Athens, the T1 video, so I've got to set up the voiceover, which is done, it just needs to be booked with the guy, he's all ready to roll on it, the script's signed off so I can do that, and I've got to respond too, Athens sent me stuff on Friday, so I've got to shape that up into a form I can send on to the client really quickly, today so…*
>
> **George:** *I think it was looking really really good going in,*

Simon: *yeah, should be cool*

George: *I don't mind all the words on it, there's a few that are a bit heavy, but yeah. I still think some of those keywords should be there.*

Simon: *okay,*

George: *Have Athens agreed the cost?*

Simon: *yeah, they agreed to the cost at the beginning, so what I need a cost for and direction on is the sound effects, so I've got to check that, like the soundtrack, so (notes) confirm soundtrack.*

Frank: *I'd quite like to see that man, not actually seen it,*

James: *not seen that for about two weeks*

George: *what's really nice about that is Simon did the art direction and helping shape the script, you know, we did some scribbles internally that I did with Simon and then we passed them on to (contractor) and they're going to turn those initial scribbles and ideas into a moving animation, so it's quite a good example of collaborating with them, I think it'll be a good one to see if it works out or not.*

James: *Nice*

Simon: *they're good folk*

James: *what about timelines for that?*

Simon: *I've got to get signoff on the storyboard, final sign off, I'm gonna need half a day for that, at some point this week, throughout the week, in total (notes down tasks)*

Examining the above excerpt, it is apparent that social relations are being assembled and maintained as opposed to simply assuming they are present. In doing so, the everyday making and maintenance of associations of organization become visible.

First, let us examine the different humans (H) and non-humans (NH) outlined by Simon; the client (H) (Athens), the video (NH), the voiceover (NH), the subcontractor (H), the script (NH), and the client's direction and budget (NH). Raised within this particular example of ordering, the meeting acts a location where this chain is transformed and extended. By bringing the different items to the attention of the other designers, Simon acts as a mediator between the script, the client's wishes and the input of the other designers. As Frank and James have not been involved with these particular processes, they too, just like the technical objects, need to be enrolled in the program or else they have no influence.

If the activity is to be successful, there must also be movement, as the durability of social relations are inexorably tied to their continued performance (Latour, 1984). The scribbles have been transformed by the animators, and must now undergo a new association with the script, which itself will take the form of a voiceover. Meanwhile, the costings must be negotiated to make sure the project is funded, otherwise certain parties interests will be compromised, and forced to disengage. As can be seen, transformations are taking place, ideas have become sketches, which in turn become animations in the hands of the subcontractors, which become a talking point and subject of budget discussions at a meeting, all of which will eventually form part of a message the Athens company wishes to convey to its unsuspecting clients, who may in turn ultimately accept or reject the final product.

If we strip this account of the technical objects, we also strip it of important associated mediators, and our understanding of technique becomes obscured. To be sure, we can point to chains of human-human interaction, but it will not last long or achieve much. Frank and James cannot influence the process without engaging with

the current associations in the chain or introducing new ones. Returning to the designer's descriptions of their work, it is clear that despite how it may be represented, it is difficult to understand what the processes of production without considering the non-human aspects which inform it. This feature was particularly noticeable in the designers descriptions of the organization of the design process, which I asked them to reflect upon;

> **Howard:** *is there anything bad for the design process, um yeah, lots of things. Open ended briefs, in terms of creativity and deadlines, I think design, to flourish, really needs constraints, from a creative standpoint. You know you'll find when you're restricted by, whether its materials or whether it's the client saying it has to be red, whatever, you're going to find creativity more easily, You're going to make much stronger work when you're working within constraints, and also you've got to have deadlines, if you have an open ended deadline, open ended brief you might find that something just kind of drags on and on and you get into a phase where you're just "oh I'm just going to make it a little bit better, ah I'm just going to make it a little bit better," and you just do that until the projects totally irrelevant and it never ends up becoming anything.*

Much like Latour's own examples of the hotel key fob, weighted down to stop errant guests stealing it (1984), or the sleeping policeman designed to caution speeding cars (1992), we find that even small alterations or associations to non-human agencies can have marked effects on the paths of action. For Howard, the role of constraints is indicative of such effects. The stipulation of a single colour and a fixed amount of time both furnish the process with direction, something which cannot be guaranteed or easily sourced when simply considering the different possibilities or potential of a project. The seemingly paradoxical position that constraints can aid creativity (Gersick, 1995) is less impenetrable when the role of different agencies are

considered. In this case the position that less possibility can somehow equal an easier path toward creative outputs is made clear by stipulating that the constraint (the colour red, the amount of time) is in fact another agent whose effects order the process of production.

As technical objects hold a share of agency in different configurations of action, offering stability to relations, it also holds that disrupting them can have unanticipated consequences, as Jenny and Howard both describe:

> **Rory***: in terms of external factors, or you could call it management, what is good for the design process?*
>
> **Jenny:** *in terms of management?*
>
> **Rory:** *yeah, what do you need to design well?*
>
> **Jenny:** *a clear brief, something that's not going to…a structure that you know isn't going to change, so if you're designing something and you've got content, and you're designing it based on what you've been given, and that changes, it can alter the whole thing, and people don't really realise sometimes, you might get something like an extra logo thrown in at the end, and it's like this is going to shift, like the other day me and Frank were working on a project and they asked for the pt. size to be moved up, made slightly bigger, in like a 60 page document and that just …. Absolutely everything, we had to out 5 extra pages, it means the print costs go up, it puts on days that you don't have factored in for that job*
>
> ***
>
> **Howard:** *Another bad thing for, I don't want to, I'm a little hesitant to say this but overinvolved clients can be a bit tricky, on one hand you want them to be engaged, and it's a different design if they're engaged, it's good for them, it's good for us while were designing if were educating them on design, that they understand it to an extent and they understand the value of it, which*

is really important but I think every designer can tell you horror stories about a client that you know called them up at 3am and asked them to move something 20 pixels to the left ….That just drives you insane.

As the designer's reflections on their work shows, the associative techniques which bring different agencies together-and in some cases keep them apart- are essential to successfully organizing and navigating the process of design. Tools, machines and materials offer different capacities, and interact differently with other agents: the colour red or the draft text offer completely different relations to the client and the designer.

To focus only on the social therefore, is to ignore the other morphisms which make collective action possible, to ignore the different assemblages of technical action (Deleuze and Guattari, 2004) and also prevents a processual understanding of how things change (Chia, 1999), without relying on the explanation of the social as being the centre of all action. As Latour (1994a) suggests, it is the different morphic qualities of different agencies which leave the possibility for controversies to be reopened, as any given configuration is never final and open to reordering, however inert it may appear. The capacity for forgotten agencies to be re-engaged, or for new ones to become associated is always possible. This potential for different forms of ordering is well understood by the designers, who recognised that the value of their work did not necessarily end with the finished project, but remained with the ideas and how they could fit in future chains of interaction, and as Simon explains:

Simon: *…I think folk have got to understand that, I don't know, I think it's maybe how we communicate the value of the creative thinking, maybe quoting for it as a separate part of the creative process, maybe just helping clients understand that they can take those ideas and use them , it's not just*

because its digital output, it's not, or it's not a final thing, it's something that's got a lot of value they could use, but then I guess from their point of view, unless something resourced completely right down to the final thing they can't put it out there, they can't use it without your help.

Rory: *so do you think they see a finality where you don't?*
Simon: *yeah, well the clients always think in terms of things like logo, website, and you know, we all know that the actual value is in bringing all that stuff together in some sort of strategy, and that's the hardest bit again, making it look good is easy, and that's why when you work with a really good marketing person, it makes our job a lot easier, because they've done all that work and they present it to you in the brief and you just have to focus on it, otherwise the designer has to do that…*

The potential for further development, and the value of the work, lies in the particular associations within which it currently exists, and also in the future relations it may enter into. As Simon suggests, the value is not intrinsic to the technical object, but in the bringing of different things together into a particular strategy. Building upon the recognition of agencies and the way they swap properties, it is therefore important to also consider the associations which develop in doing so. The shaping of these associations – what I have described as ordering (Harris, 2005; Law, 1994) – are what form the path through which production succeeds or fails. The difficulties which accompany these successes or failures can be traced back to the additions and displacements found within the different techniques utilised.

Artifice

Having established the different agencies found within techniques and how they connect together, I now consider the strategies in which these agencies are allied and

disbanded in action. Here, I return to the figure of Daedalus, Latour's (1994a) eponym for the cunning artifice and technical means through which objectives are achieved. As the author suggests, the artifice of Daedalus does not emerge from episteme – from the abstraction of knowledge by a purposive subject about the underlying nature of the world, but from *polymetis* – the allying of different agencies in the service of action. When different agencies are invoked, human action is overtaken, transformed by the different agencies it interacts with. Humans however, are not powerless, and must attempt to navigate such transformations, weaving and folding different properties offered by different agencies to arrive at new solutions to the problems presented by everyday life (Letiche and Statler, 2005; Chia and Holt, 2009). In order to understand the functioning of techniques, it is important to understand the tactics found within the interactions of humans and technical objects.

Polymetis – the bag of tricks– represents an underdeveloped theme within Latour's work that can benefit process organization studies. Within his accounts of different techniques we find tactics, ruses and ploys as different chains of humans and non-humans seek to gain the upper hand. The reason for this intriguing choice of language, often overlooked in organizational adoptions of the authors work, is that for Latour, both humans and non-humans are continuously engaged in adversarial trials of force[10] (Brown and Capdevila, 1999), which are either settled or re-opened as new actors and associations emerge. In order to succeed, chains of humans and non-humans must navigate these trials. Throughout *Science in Action* (1987) Latour identifies a number of strategies invoked by humans and non-humans in order to strengthen a particular claim. On the side of humans, for example, Latour notes the rhetorical strategies deployed to ally other humans to a particular cause. They may,

as his examples of Pasteur, Diesel and Eastman elaborate, seek to convince other humans that their own needs or being served, or convince them that their own desires ought to change. They may offer them shortcuts to the desired outcome, or finally engage in subterfuge to reshuffle or blur priorities by introducing new actors or displacing old ones. On the side of non-humans, we find similar tactics. Should rhetorical strategies prove unsuccessful or reach a deadlock, non-human agencies may provide the pivotal transformation; the agreement signed on paper, the experiment which lends support to the theory, the prototype which provides proof of concept, may all intervene to tip the balance in the favour of a particular course of action.

As has been established in the previous section, a theory of technique is focused on a vision of society as a collective of different agencies. Following this step, it is then necessary to consider the strategies and alliances which draw humans and non-humans together. At the interface of techniques, where technical chains are linked together in the pursuit of producing a desired effect, we find such ploys. Take for example, Latour's reading of machines, which he suggests should be understood firstly as *machinations,* an artifice "where borrowed forces keep one another in check so that none can fly apart from the group" (1987, p.129). These borrowed forces involve humans and technical objects, as Latour's description of the British cotton spinning industry conveys:

> A worker…attached to the machine in such a way that any failure of attention resulted not in a small deficiency in the product that could be hidden, but in a gross and obvious disruption which led to a loss of piecework earnings. In this case, it is part of the machine that is used to supervise the worker. A system of pay, detection of error, a worker, a cotton spinning machine were

> all tied together in order to transform the whole lash-up into a smoothly running automaton (1987, p.130).

The implementation of techniques, such as those witnessed in the Atlas and Helios studios, often led to this type of adversarial, tactical scenario. Indeed, much of the everyday activity in the studios reflected the need to balance and negotiate the different demands imposed by different forces. One such activity was the management of time, which often became the battleground for different tactics and interests in the process of production. Take for example the common position in both studios that "time is money"; a position which, when considered as a tactic for the enrolment of a series of humans and non-humans, in practice is made actual rather than understood metaphorically. In the Helios studio, Frank described how the budget shapes his relation to the time designated to a project, particularly with regard the boundaries between work and leisure time:

> **Frank:** *I guess I just kind of think there's a cut-off point, it's quite difficult, because I think you'd happily carry on experimenting for ages, I think it tends to be around budget, wouldn't you know, just trying to contain it within that. When you've got x amount of time to spend on it, and you probably spend a wee bit more than you should do, but it's purely through budget. I mean I'd happily take something home and spend a bit of free time on it, if it needs that time I think it's worth it, and I've done that with various jobs.*

In his typical design process, Frank is forced to account for his time in relation to the value attributed to it. This mechanical (quantitative, chronological) translation of time renders it equivalent to the financial value designated to the project, though does not always correlate to the right (qualitative, kairotic) time in which elements within the collective may fall into their place for Frank to achieve his own aims (Orlikowski and Yates, 2002). To say that "time is money" in this sense is to literally

state the nature of transformation which so regularly overpowers other considerations in the studios. As Barbara Czarniawska suggests, it is not enough to take such states of affairs for granted, but rather care should be taken to at the specific technical arrangements which enable them. To this end Czarniawska argues that "organizing dependant on hard technology could force chronological time to be a priority, whereas organizing dependant on soft technologies could have more opportunities to create kairotic time" (2004, p.777) opening the possibility for such relations to be explored, rather than tacitly accepted.

Time, however, particularly when understood in relation to different agencies, is a thorny issue, and one which Latour's work appears to complicate further. One the one hand, Actor-network studies have been described by some as offering the tools for organization theory to think about becoming (Hernes, 2010). On the other, it is described as proposing the exact opposite. As Graham Harman (2010) notes, the question of time/becoming is an unresolved issue in Latour's work, which Harman considers to be incompatible with ideas of flux, becoming or process. Harman concedes however, that Latour does often make use of the idea of actants having a *trajectory or history,* which I take to be a form of becoming in some sense.[11]

From a process perspective, this presents an opportunity for further clarification and theoretical development. Latour himself has argued that "[we] never encounter time and space, but a multiplicity of interactions with actants having their own timing, spacing, goals, means, and ends" (1996, p.181) raising the prospect of many *different* timings, durations or temporalities involved (Deleuze, 1991; Law and Mol, 2001; Czarniawska, 2004).[12] Granted, this is different to the sense of becoming generally offered in process studies as the other half of being, but can it offer a useful

resource? Notably, Latour builds on Serres view that "time can be schematized by a kind of crumpling, a multiple, foldable diversity" (Serres and Latour, 1995, p.59), and argues that to take part in technical action is to insert oneself into a "garland of time" (Latour, 2002, p.249) in which multiple temporalities become apparent. Viewed in this way, we may consider the different temporal resources not just made available, but which actively influence organizational events; as Czarniawska has suggested, time applies not only to the organizational actor, but to the system.[13]

As the above discussion shows, working in a technical environment exposes a multiplicity of different timings which must be navigated (Jones, McLean and Quattrone, 2004). The management of time, be it qualitative or quantitative, individual or social, with its negotiations and calculations offered a variety of cases showing how humans and technical objects hold the possibility for controversy, deception and trials of strength in this regard. Designers in the Helios studio, for example found that the client's perception of how long something should take often became another factor within their program of action:

> **Simon:** *I find it hard, because, and I think this is something we're working on, I think it's something we could improve a lot on, it's just that tension between enjoying your work, doing a really good job that you believe is the best that you can do within the circumstances and limitations, and doing it on time. There's always going to be that balance. I think in terms of day to day, I think there is a lack, because of, because the design industry always presents itself as working by the hour, I think that's how clients understand it, and so if they have a belief that something shouldn't take very long, you can try your best but you're not going to persuade them otherwise, and that's where things get tricky.*

As Ingold (2000) has argued, temporality has regularly been attached to the length of time taken to complete a given task. The decisive feature in the extract above is that as an employee, Simon is not free to dictate how long the task will take, and must at least negotiate it with the client. Ingold argues a similar point, stating that whilst a task orientation still exists within work, it is too often conceived from a commodity perspective, which in turn impresses a different logic upon the processes of working (Deleuze and Guattari (2004) raise a similar issue with respect to flows of capital re-directing traits of expression). At the centre of this commodity perspective, are of course the technical objects of design and production, which become the focal point for how long a task should take. Simon highlights the problem with this way of thinking:

> **Simon:** *So when somebody phones you up and says "I've just got this thing, it's only going to take a few minutes," you can do it throughout your whole day and very quickly, even doing simple simple things like, we would put the same effort into an a4 flyer that's got 2 sides as into a you know, a brochure, you know, you still need the same key things there, you need the content, you need the assets, you need the visuals, it's almost easier to do slightly bigger things, so if somebody has this idea that the size and the scale and the sort of, that defines how long it's going to take, when its actually more about "what is it?" what's it saying, what have you got to use…*

Simon notes a new, quantifiable transformation: his client, equating the time taken to the physical size of the finished product, rather than to the hours spent at the computer or in discussions which lie behind its formation, sets expectations which do not correlate with his own view of the project. As highlighted in the previous discussion of technical objects within design, what began as one set of goals with a particular non-human has been transformed into another by other agents. Jenny finds

a similar problem with establishing with the client what exactly is being paid for, and how time becomes the critical resource:

> **Jenny:** *…when people say "you've just designed 4 brochures for us, can we have another brochure designed by tomorrow" and you have to be like "okay but that's going to take you two days and that's going to cost you this". And you have to be able to put it in a number they can understand because if you just pull a figure out of the air "well hold on a second you did this whole, you know these 4 brochures based on this same template for this much money, it's going to be less work than this and it's the same price or whatever, you have to be able to be like: "because of time. Because of the time taken". Because that's what people think they're paying for.*

As the above description shows, the tactical enrolment of different agencies is not a one way street: the designers find themselves both attempting to steer and being steered by the interests of others. What is particularly interesting however, from the viewpoint of technique, is how the deployment of such strategies both stabilizes activity, keeping it in check, yet also provides the potential for change and transformation. Whilst on the one hand Jenny suggests the calculations provide a handy rationale to protect their interests against those of the client, it in turn also shapes the way work is managed internally:

> **Jenny:** *I think because really that's the only way to do it so that you don't get carried away, I think if I'm working on a project on a week, and it's a really fun project, you know I could easily spend a week on it, but I'm not going to get paid for a weeks' worth, I'm only going to get paid for two days, because I could have done it in two days if I'd just been a bit more decisive about certain decisions, you know, cut down the process basically to achieve what I need to achieve in a small amount of time, so yeah, but the thing is as a designer you're never really finished, you can always carry on developing something really…*

To avoid the potential for disappointment, the designers often find themselves dictated by others; by timeframes, budgets, expectations and industry norms. This price however, is one which is paid with the realisation that providing consistent, on-time work is what sustains the business.

In a manner similar to Latour's "centres of calculation" (1987), the term used to describe the locations of fact production which allow knowledge claims to succeed, so too must the studios engage in a particular series of tactical transformations to maintain both credibility and their own sense of internal consistency. This is particularly true when managing different interests and deciding what strategies should be employed when taking on new work, which battles should be fought and which should be avoided. In the Helios studio, a novel approach was developed to deal with these issues:

> ***Jenny****: …has Simon talked to you about the numbers thing, the process where we put numbers on a job? Based on cost, connections, client exposure?*
>
> ***Rory****: no, never talked about this*
>
> ***Jenny****: No? Okay this is a really key thing we should probably talk about then. So when you're assessing a new pitch or assessing a new client, basically they're assigned a value based on how much money they're going to be bringing in, what the creative value is to us, and what the potential repercussions are in terms of exposure.*

I ask if it is similar to modern types of accounting, and Jenny describes a similar system developed for assessing pitches currently on the marketplace:

> ***Jenny:*** *but we don't use it*
>
> ***Rory:*** *you don't use it?*

Jenny: *yeah, I think possibly because it's something that's not coded and we can't input and figure it out, it's something we do manually, so we really should get into the practice of doing it, it's like keeping a note of, it's just another management thing basically, when a new client comes in we should put them on the sheet, assign a creative value, assign a cost value, and like every time doing that, and also its completely based on our opinion,*

Rory: *yeah it's subjective*

Jenny: *so say were going to design a logo for a small company based in* (Location) *and they don't earn very much money*

Rory: *80% creative!*

Jenny: *(laughs) yeah*

From the viewpoint of technique, we may ask what is being achieved by this process. As Jenny's comments suggest, there is a hesitation for two reasons; firstly, the technical object constructed by the designers is still manual, it has too much of the human aspect on show, perhaps the designers themselves are not sufficiently hidden, making the intended task of rationalising different design choices all the more difficult. Secondly, Jenny also recognises that even the act of designating a number is still representative of her opinion. With these negative directed at the object, it would be plausible to think that the results of the process would be ignored. Yet curiously, the assessment tool still operates:

Rory: *do you think something like that would actually stop you from doing it anyway?*

Jenny: *yeah, we had that recently with a project,*

Rory: *oh really, you just said no? Okay…*

Jenny: *mainly because it was like a really small scale, it would have been nice creatively but it wasn't "that" nice creatively and it was kind of, you know…*

Jenny: *so that's us assessing the value of something though, based on what we think we're going to get out of it, which I think then impacts the design process, because if you're like working on the design time wise…yeah I'm not getting a lot of money for this, if I feel it's right, the contracts I'm going to get from this, would be good, which happened recently for a project that we did for someone, a big company, but like we were getting paid such a small amount, I put in more days than I should have done , but I was encouraged to, but then since that we've had like the guy fed back that he was really really happy, to the point where he's put us in touch with other people, showing the work even though it didn't go ahead, and being like this is what they can do, you know, it's like having a rep out there or something for your work, without having to like, you know, do it yourself, which is kind of what it's all about, getting new work, that's how you do it, it's through contacts, it's through people that stand up for you and say HELIOS did a really really good job on this, you know, look what they can do, really creative, fast turnaround, so…*

…

Jenny: *but obviously we don't use it enough for me to be exact, also that's a really logical, numerical, mathematical way of trying to quantify something that is instinctual you know,*

Rory: *so do you like it?*

Jenny: *I don't know, but then I'm not running the business, so kind of like, I think it makes sense, but also I think the quantifying something's creative value, is really hard to do as well, and I think it's very difficult to be like, it's definitely that number, because three different people have three different opinions on what that number is, especially when they have certain projects that they like to do …*

As can be seen, the function of the centre of calculation is to translate things to strengthen their claims or chances of success. The price of such translations, which must always do a certain violence to the original is reminiscent of John Law's warning that the process of transformation, of shifting or changing into new collectives "also implies betrayal: traduction, trahison" (2008, p.144) for humans and non-humans, just as words to numbers or from one language to another.

The Daedalian manoeuvres in the designer's studio are not perfect; they do not provide total anonymity to make decisions out-with the view of the collective, and they present the further difficulty of having to translate creative work into numerical representations. What they do provide however, are a means of progressing through what can be difficult decisions, not by enforcing control upon a situation, but by preparing themselves for the "twists and turns of events" (Chia and Holt, 2009, p.200). They are a ploy, an example of artifice -*polymetis*- one of many techniques enlisted to ensure the smooth running of the studio.

Conclusion

In this chapter, I have sought consider technique from a process perspective. In particular, I have focused on process studies which have utilised the resources of Actor-Network theory, which shares a common lineage with those from the related disciples of anthropology, philosophy and sociology, whilst also presenting new lines forward for further exploration. I have drawn upon empirical material collected in the Atlas and Helios studios as well as the work of Bruno Latour (1994a, 2005b), Gilles

Deleuze and Felix Guattari (2004) and Gilbert Simondon (2017) to consider the nature of human and technical interaction within techniques, focusing on three dimensions, which I suggest may assist in understanding techniques and their mode of operation. The first dimension considers how agency should be understood in relation to technique. The second dimension considers how techniques are ordered and the associations which help build the basis for productive activities. The third dimension examines the artifice and ploys involved in allying human and non-human agencies together in the pursuit of particular goals. By way of a conclusion, I will summarise these three areas their relevance theory to process organization studies.

The first dimension relevant to understanding technique involves the boundary commonly held between people and things, and their ability to influence each other. Much like other process theories drawing upon ANT, I have argued the nature and capacity of humans and technical objects must be rethought in terms of their agency to account for their shared effects on the process of production. Developing the viewpoint further, I have drawn on Latour's (1994a) concept of 'swapping properties' to highlight that where technique is concerned, distinctions between humans and technical objects are both difficult and less relevant than the process itself and the transformations it produces. It is hoped that the concept of swapping properties and the related idea of deterritorialization (Deleuze and Guattari, 2004) can be used to build on the ontological groundwork which has been laid down by process organization studies to further consider how different agencies influence organizational practice. These concepts also hold value for showing how subjectivity is affected in the process of production.

In the second dimension, and with particular reference to processes in the studios, I have highlighted the visible effects techniques and the designer's technical choices have on both perception and capability. Techniques may therefore present an ideal interface at which to consider the ways technical objects change people and vice versa. Given the above observations on the agency of people and things, I have sought to then show how they are ordered to form both techniques and wider organizational structures (Harris, 2005; Law 1994). By drawing attention to the relations between the constituent parts, this section argues that the techniques of ordering rely upon technical assemblages rather than just social relations. Key to this capacity for ordering is the stability offered by technical objects, which when coupled with the social intentions of humans can join to form a durable whole. Such technical objects however, are not passive, and maintain their own coherence which may hold unexpected or unintended consequences within this mediated action (Simondon, 2017). Through an analysis of the designers experiences I examined how particular properties of different agencies form associations in the process of production. As such, it is associations and the ways in which they are ordered which demand attention, rather than any part in isolation.

Finally, having established these dimensions of technique, I examined the intrigues which lie in their utilization within action. Returning to the image of Daedalus and his bag of tricks, this section considered the machinations, artifice and manoeuvres involved in allying and enrolling actors into programs of action. Examining the temporal resources made apparent within the associations I focus on a particular artifice – calculation– considering how different properties and associations are used

in adversarial trials of strength, in which different properties are drawn together to achieve different aims.

Taken together, these three dimensions lay the ground for the study of technique which offers distinct contributions to process organization studies. Firstly, the dimensions of technique provide a processual reading of how agencies interact during production via the ideas of swapping properties and deterritorialization, avoiding the risk of identifying different agencies but continuing to treat them as fixed categories. Instead, a processual reading of technique points to a technical becoming achieved through engagement and transformation between humans and technical objects. Secondly, the dimensions of technique provide an outlook which challenges the common substantialist position within organization studies to reveal the ongoing construction of organizational activities via technical means. By examining the ordering of particular techniques (and the techniques of ordering), the different compositions of humans and technical objects are made visible. Thirdly, the dimensions of technique open the question of technical choice in everyday activities, and how different agencies are drawn together and utilised in ploys, schemes and artifice to achieve desired outcomes.

In the next chapter I critically apply these insights to the field of organizational creativity. Specifically, I examine both the historical difficulties in dealing with technical objects and the problems this poses for the contemporary study of creativity in organizations. Identifying three lines of critique, I utilise the dimensions of technique to show how the issues of missing objects, directionality and a social definition of novelty may need to be reconsidered.

4. CREATIVITY

Introduction

As the previous chapter demonstrated, an examination of technique exposes the different relations found between humans and technical objects, allowing for detailed exploration of the processes agents in the Atlas and Helios studios engage with. By drawing attention to technical aspects of the assumed essential, natural or unexamined characteristics of organizational life, I have argued that technique should be understood as a matter of agencies, associations and artifice – aspects found most particularly in processes of production. This process view of technique holds value for organization studies in rendering such technicity visible, exposing technical associations where we expect to see the social or the natural.

In this chapter, I argue that an existing emphasis on social and psychological factors lead to misrepresentations of the notion of creativity, which, despite attempts to the contrary, is still often reductively treated as the sole domain of the creative individual (Glăveanu, 2014). Even in studies where the creative individual is de-centred in favour of social aspects, there is little said on the role of techniques, tools, machines and materials in the process of the act of 'creating' (Miettinen, 2006; Tanggaard,

2013). As I argue in this chapter, the exclusion of technical objects and the attendant *tekhne* of production from an analysis of creativity each stem from fundamental assumptions on the nature of thinking and doing. These assumptions have in turn stymied the study of creativity, leading, by turns, to an image of creativity disconnected from its own praxis (Rehn and De Cock, 2009). Opening creativity research to matters of technique, this chapter addresses these issues, and in doing so points to a new direction for how process perspectives can inform study of creativity in organizations.

The chapter begins with an analysis of the problematic relations between creativity and technique. In this section, I suggest that much of the present difficulty stems from the classical degradation of the craftsman's practical arts (*tekhne*) in favour of those activities emphasising thought and reflection. This distinction led to a disconnect between the material process of creating and the creativity of the individual, excluding the possibility of technical objects influencing the creative process in anything but an accidental manner. The result was a "mechanistic cosmology that separated design from construction" (Ingold, 2000, p.289), and a subsequent reduction of both technical objects and technical activity to mechanical implementation. Whilst studies of technology in organizations have grappled with the legacy of the undermining of technology (Grint and Woolgar, 1997), there remains work to be done in addressing the effects of this disconnect between human and technical affairs.

To help situate these issues, I provide a review of the field of organizational creativity, discussing the different approaches in order to provide context to my criticisms. Then, returning to process organization studies, I consider some important

works within this domain (Chia and King, 1998; Hjorth, 2005, 2013; Styhre, 2002, 2006) which can offer resources to address the shortcomings created as a result of disconnecting *tekhne* from creativity.

Next, I present the specific ways this disconnect has impacted the study of organizational creativity, before utilizing a process perspective to move beyond it. I identify three areas which show the effect ignoring the technical aspects of the process of creating has already had, then, via empirical material collected in the Atlas and Helios studios, offer an alternative through the inclusion of technique.

To begin with, I highlight the absence of technique and technical objects from studies of organizational creativity. To date, research concerning organizational creativity has focused predominantly upon individual and social aspects at the expense of their technical and material counterparts. From the perspective of technique, this is unacceptable, as it overlooks the possibility of considering the technical processes through which an idea finds its form or physical expression. In doing so, studies of organizational creativity effectively partition off an area of the creative process from their analysis. One solution to this issue is, I suggest, to re-engage technique through an examination of the different agencies found within the creative process, addressing the implicit hierarchy of the individual creator imposing pre-existing forms onto inert matter (Ingold, 2009; Latour, 2002; Simondon 2017). This aims to unsettle the view that the creative process is always rigidly fixed to the individual's idea, and will always precede its implementation.

The inherent difficulty with this position is that creative ideas are, by their nature, not easily accessible, yet must somehow be connected to tangible outcomes. Regrettably,

much of the existing organizational literature is silent on exactly how this is achieved. To overcome this difficulty, many studies of organizational creativity begin their analysis with a finished product, which leads to the second effect of ignoring the technical processes of creating; the issue of direction. By waiting for a product to be both finished and retrospectively deemed creative, organizational studies of creativity lose much of the impetus for describing how creativity emerges within production. Viewing creativity in this 'backwards' manner, there should be little surprise that accounts often emphasise the individual and social contributions, at the expense of the artificial means by which creative outputs are achieved. Reversing this process and reading creativity 'forwards' (Ingold and Hallam, 2007; Ingold, 2014), the idea appears as just one of many forces which inform the final product. These two competing readings of creativity find their empirical expression in the designer's distinctions between designing and making, which highlight the consequences of adoption for both.

Finally, as studies of organizational creativity often deal exclusively with ex-post judgements of 'creative' products, there exists a heavy reliance on a social definition of novelty. This social definition stems from the perceived difficulty in the attribution of new and useful products (Amabile, 1996), and the difference between personal achievements and achievements of historical merit (Boden, 1992). The insistence of deciding upon the value or novelty of a finished product, however interesting, is only one facet of novelty, and one which is severely limited with respect to examining the process of creating. In contrast to approaches which rely on social judgements, I examine the role of repetition and replication to highlight how the process of creating engages with what already exists to generate the new. In this

processual view, novelty is not something deferred to future, expert judgement, but a quality which emerges and necessarily accompanies change (Chia and King, 1998; Garud et al. 2015). In sum, I aim to utilise technique to re-engage creativity research with the areas it has overlooked, and open up new areas for research within process organization studies.

Creativity and the Problem of Technique

The demand for creativity and its counterpart, innovation, particularly within contemporary organizations, needs little elaboration (DeFillippi, Grabher, and Jones, 2007). Often treated as synonyms (Miettinen, 2006), there has been a concentrated effort to understand and improve the processes which will allow organizations to render them workable, dependable and efficient (Purser and Montuori, 1999). In their eagerness to provide such improvements however, organizational theorists of creativity have sought not only to provide descriptions and perspectives, but also programs and prescriptions, all based upon a particular set of assumptions on the nature and requirements of creativity. It is organizational creativity's pursuit of this programmatic understanding of how useful novelty can be identified and improved, which continues to draw praise (Zhou and Shalley, 2007) and criticism (Prichard, 2002; Osborne, 2003; Peck, 2005) alike. Within this programmatic understanding however, a problem emerges. The two engines which have driven modern innovation –that is, creativity and technology– are treated as analytically separate. On the one hand, creativity is not held to require technology, which as we shall discover, is omitted from the majority of organizational creativity literature. On the other, technology is not held to be creative, and indeed its inclusion may even stifle,

standardize or reform creative action into mere production, removing the potential for difference. Can it be that creativity and technology are so distinct, even opposed to each other within practice? In what follows, I aim to show that they are not.

It is not by chance however, that the figure of Daedalus and the *polymetis* of his technical ingenuity are found to be under-represented. The separation of human and non-human affairs, particularly where technique is concerned, represents an enduring legacy of which the field of organization studies is one amongst many heirs. In order to clarify the nature of this problematic relation between creativity and technology, it is necessary to trace the origins of their separation. Considering the difference between the human arts and the supposedly mechanical outputs of technology, Tim Ingold has argued that the etymological root of the word - *tekhne* - denoting "the ability to make things intelligently" (Bruzina, 1982, p.197, as cited in Ingold, 2000) points to a pre-existing unity of creative and technical action. In a similar manner to Sennett's (2008) descriptions of craftsmanship, *tekhne* referred to an artisanal form of making, in which the end goal may be determined, but the means are not yet formalised. As such, the creativity of the artisan lay not just in the formation of their ideas, but also in the technical processes of their implementation. With the growing adoption of a mechanistic view of nature however, the image of the artisan "was gradually supplanted by that of the operative whose job it is to set in motion an exterior system of productive forces" (Ingold, 2000, p.295). Proponents of this view of nature sought to uncover and determine the underlying mechanisms of the artisan's actions, fixing a rational *logos* to the artisan's previously itinerant *tekhne*. The effect of this rationalisation, Ingold argues, was to "remove the creative part of making from the context of physical engagement between workman and material,

and to place it antecedent to this engagement in the form of an intellectual process of design" (p.295). With the conception of an idea now separated from its execution, the creative *tekhne* of making and technical action became joined with the previously separate concept of *mekhane*, which referred to the operation or implementation of mechanical principles (Chia and Holt, 2009).

Within this mechanistic ideology two problems may be identified. First of all, the artisan's actions are disconnected from creative production. Their practical *tekhne* no longer deemed necessary, the artisan acts merely as an "accessory to processes which have been laid down in advance" (Ingold, 2000, p.296). In this account the creative act has already occurred, and all that remains is a set of instructions or principles to be followed in its implementation. Ingold points to the dichotomy between architecture and the building industry as one of many modern institutional examples of this undermining of *tekhne*, consisting of 'creative' architects who design but do not implement, and builders who implement but are not held to be 'creative' (p.295, cf. Coleman, 1988, p.15-16).

Secondly, this reduction of technical practice to mechanical implementation has also had a derogatory effect on our understanding of the role of technology, which, after a conflation with *mekhane* comes to mean "an instrumentality of a particular sort, namely, that which can be separated from the specific context of human experience and sensibility as operative in making" (Bruzina, 1982, p.167, as cited in Ingold, 2000). As identified in previous chapter, technique belongs to a worldview in which technologies represent more than schemes to be implemented, and in which the technical cannot be reduced the merely mechanical. The aim drawing attention to technique is to show that the technical has its own *mode of existence*, belonging "to

the human world in a modality other than that of instrumentality, efficiency or materiality" (Latour, 2002, p.248). Neither *tekhne* nor technology should therefore be thought of as reducible to the practical application of scientific theory or mechanics (Caws, 1979).

What then, is the contemporary legacy of this shift from a creative *tekhne* to the modern image of technology? One perspective, offered by Ingold, is that with the separation of design and execution, "no space remains for the practical knowledge (or knowledgeable practice) of the craftsman. Technology, in short, appears to erase technique, rather than to back it up." (Ingold, 2000, p.316). This point is also raised by Sennett, who, in noting the mistreatment of the ideals of craft, finds that they are too often pitted against technology, rather than recognising the creative potential within it (2008, p.24-8). Furthermore, an anterior creativity cut off from the material world, is treated as fundamentally different in kind to technology: one which subsequently guides the generation of new things. To adopt this view however, "is to deny the creativity of the very process of environmentally situated and perceptually engaged activity…through which real forms emerge and are held in place" (Ingold, 2000, p.354).

The conflation of the technical and the mechanical leads to the modern uncritical position that technology refers to mechanical objects, or, worse, that technique, adhering to a mechanical objectivity, acts as a dehumanizing or deterministic force upon human affairs (Ellul, 1965; Grint and Woolgar, 1997). The modern separation of creativity and technology is, I believe, partly attributable to the arguments above. There are also however, the particular rationales found within the organizational literature's presentation of creativity and its own theoretical developments which

work to further enforce this undermining of *tekhne*. To resolve these matters, I will first present a review of the organizational creativity literature before considering in further detail how studies of organizational creativity can benefit from the inclusion of technique.

The Study of Organizational Creativity

The separation of technology and creativity represents a significant issue for studies of organizational creativity. Whilst to date, the literature has successfully focused on psychological accounts of creative individual and group behaviours (Amabile, 1996; Perry-Smith and Shalley, 2003; Harvey, 2014), an overall neglect of technology has resulted in a series of problems which are dismissed as necessary or intractable limitations. Although such neglect is not uncommon within organizational studies, the issue finds an extreme case in studies of creativity. The matter is further complicated by organizational creativity theorists' particular treatment of creative products, which, despite being excluded from descriptions of the creative process, are taken to be a reliable indicator of its occurrence. How then, can a research program that excludes the material world at one stage come to rely on it at another? The answer, I will argue, is only at a significant theoretical and methodological cost. To explore these matters further, I begin by providing an overview of the field of organizational creativity, dealing with the dominant psychological perspectives. Following this, I then provide a review of creativity studies informed by process perspectives, which provide an appropriate onto-epistemological stance from which to consider the inclusion of technique and technical objects. Following this I explore these matters empirically in the Atlas and Helios studios.

The field of Organizational Creativity

When the study of organizational creativity emerged in the late 1980's, it was presented as a salve to a field too closely concerned with individual differences (Amabile, 1988, 1996). Although (as shown previously) the problems of creativity have their origins in classical thought (Ingold, 2000), and have naturally been a concern of numerous disciplines (Koestler, 1964; Arieti, 1976), much of the seminal organizational literature can be traced back to the post-war re-imagining of creativity as a measurable, testable psychological construct (Bailey, Ford and Raelin, 2009). The impetus for this image of creativity is often accredited to J.P Guilford's (1950) presidential address to the American Psychological Association, in which he laid out the foundations for its study, lamenting its neglect and situating it in the context of the thawing of relations with the soviet union (Pope, 2005). The development of a measurable, testable creativity, in Guilford's view, was not only a theoretical aim but one which could play a critical role in shaping the future fortunes of western democracy.

The criticism of Guilford's approach, and indeed much of the subsequent creativity research which followed (such as Barron, 1955; Torrance, 1972) was that a focus on measurable individual differences left too much uncovered. As Teresa Amabile wrote in her 1983 introduction to the social psychology of creativity: "there has been a concentration on the creative person, to the exclusion of "creative situations" [and] a narrow focus on internal determinants of creativity" (1983, p.5). Though inspired by positivist science, studies focusing on individual differences struggled to meet the

objective criteria needed to mirror their rigour and reliability. In particular, the lack of a global definition of creativity made generalizability an almost impossible goal.

Amabile's solution to these exclusions was to provide a social psychology of creativity (1983/1996), with organizations quickly identified as the ideal place for such a theory to have a practical and positive influence (Amabile, 1988). Amabile and colleagues have subsequently conducted a considerable amount of work in this area, examining creativity and its relationship to teamwork (Amabile, Conti, Coon, Lazenby, and Herron, 1996), leadership (Amabile, Schatzel, Moneta and Kramer, 2004), affect (Amabile, Barsade, Mueller and Staw, 2005) and improvisation (Fisher and Amabile, 2009). It is Amabile's (1996) seminal work however, which has provided much of the architecture for organizational studies of creativity (and social psychology more generally (Hennessey, 2003), both in its theoretical outlook and methodological approach.

Critically, Amabile's work avoided the previous difficulties in defining creativity by proposing two definitions, a consensual definition: "A product or response is creative to the extent that appropriate observers independently agree it is creative" (1983, p.31) and a conceptual one: "a product or response will be judged as creative to the extent that (a) it is both novel and appropriate...and (b) the task is heuristic rather than algorithmic" (p.33). These two definitions paved the way for creativity to be studied empirically, based on agreed subjective judgement. Amabile also identified a range of contextual factors, and the 'Consensual Assessment Technique' (CAT) to assist in the measurement of creative outcomes. Amabile's desire to understand "creative situations" was, however, unfortunately limited to the effects of these social factors on the individual's creative output, and her theory's main contribution,

somewhat surprisingly given her criticisms of individual differences, was to focus on intrinsic motivation (1996). What little potential Amabile's theory of creativity held for expanding creativity research beyond creative individuals and into the realm of technical affairs, spare some passing references to "ecology" and the importance of place on the individual psyche, then fell to the responsibility of organizational theorists.

The influence of Amabile's work can be clearly found in Woodman and Schoenfeldt's (1990) interactionist theory of creativity, which served as the theoretical basis for Woodman, Sawyer and Griffin's later (1993) organizational work. Identifying a series of variables at individual, team and organizational level, Woodman et al.'s (1993) work appeared to set out a clear program of research for the study of organizational creativity. Unfortunately, despite introducing a number of different variables, their focus inevitably returns to the creative individual (for whom all other actors exist as variables which may support or restrain the individual's creative capacity), without explaining exactly how such variables influence the creative process (Arjaliès, Lorino and Simpson, 2013). Where technology and technical skill do appear, they do so as a "domain relevant skill" (Woodman et al., 1993, p.301; see also Amabile, 1988, p.130-131) or as an organizational characteristic, distinct from creativity and creative thinking itself. Critics have also noted that Woodman et al.'s work also failed to consider that the different levels of individual, group and organization may not interact in harmony or even represent the same kind of creativity at each level (Drazin, Glynn and Kazanjian, 1999).

Similar issues are to be found in other works drawing heavily upon a psychological perspective. Oldham and Cummings (1996) for example, attempting to draw greater

focus on their surroundings, do so by considering different contextual factors (such as job complexity and supervisory style) against employee's creativity (measured on the Creative Personality Scale, previously developed by Gough (1979)). Whilst the contextual factors highlighted were deemed to have an influence, "creativity" was strictly limited to the individual employee's thinking style and output. This perspective, building on Amabile's conceptual definition, also distinguished creativity as the generation of new and useful ideas, a process the authors considered to be fundamentally distinct from the "successful implementation of these products" (1996, p.608), defined as the process of innovation.

Ford's (1996) theory addressed this distinction between creativity and innovation, or at least asked why organizational accounts between two obviously connected phenomena seemed to have so little to say to one another. Ford proposed a theory of creative action within multiple social domains, drawing on an evolutionary framework inspired by Campbell (1960), and combining psychological insights and sociological perspectives on how new ideas are introduced to certain fields (Csikszentmihalyi, 1988). Ford aimed to provide a model for creativity which would account for the introduction, selection and retention of creative outcomes, contributing to a broader discussion on how creative outcomes are received in organizational environments. Whilst the evolutionary framework provided a valuable contribution, issues remained. For example, despite clearly recognising many of the limitations of previous creativity research, Ford chose to limit his evolutionary metaphor to the individual introducing the creative variation, after which the social sphere acts as a mechanism which may choose to select, retain or reject. The environment in Ford's theory therefore served primarily as a platform for judgement,

rather than considering how it could act as a source for creativity itself (Montuori, 2017).

The main issue with these initial attempts to develop a theory of organizational creativity was that for the most part, both the social and material infrastructure of organizations—technologies, networks, social ties, and so on— were left out (or at least undermined) in favour of examining individual creativity. Recognition of this deficit began to emerge as it became increasingly clear within the discipline that the construct of creativity might not be as unitary as previously assumed (Unsworth, 2001) and that the social aspects of creativity required greater attention (Montuori and Purser, 1999). Such thinking had already gained traction in other fields, such as Mihalyi Csikszentmihalyi's systems approach to creativity (1988, 1999). Csikszentmihalyi argued that if a more robust understanding of creativity were to emerge, scholars would need to "go beyond the Ptolemaic view putting the person in the centre of creativity in favor of a Copernican model" (1988, p.336), in which creative outcomes (and individuals) were subject to much wider forces. The systems view, rather than beginning with an already deemed 'Creative' outcome, sought to uncover the different hurdles such an outcome must pass through before such a designation could be made. This approach, also favoured by complexity theorists (Stacey, 1996; Montuori and Purser, 1997) held the significant benefit of avoiding the reductionism which plagued approaches focused solely on the individual.

By expanding creativity research to consider the effects of social judgement on how creative products came to be determined as creative, systems thinking effectively changed the unit of analysis away from the creative person to the individual's

relationship with the wider social field. Csikszentmihalyi (1990) offered two key propositions to guide his approach:

> First, that it is impossible to define creativity independently of judgement based on criteria that change from domain to domain across time. And, secondly, that creativity is not an attribute of individuals but of social systems making judgements about individuals (p.198, as cited in Montuori and Purser, 1999, p.13).

Recognition of these social aspects offered new means of viewing its role within organizations. Drazin, Glynn and Kazanjian (1999) for example, offered a sense-making perspective to explore creativity in an extended period of organizational change. Key to their analysis was a number of perceived flaws with existing literature, notably the absence of time, and issues with different levels of analysis. Proposing an intersubjective approach, the authors argued for understanding creativity as a “process of sensing problems, making guesses, formulating hypotheses, communicating ideas to others, and contradicting conformity or "what is expected." (1999, p.290). The authors then proceeded to consider how shared meanings and collective frames develop creatively over time, further emphasising its collaborative aspects (Montuori and Purser, 1999). Likewise, an interest in social creativity has opened up new domians to inspire organization research. Two notable areas in this vein that have provided a wealth of theoretical insight and practical knowledge are studies of Jazz and improvisation (Purser and Montuori, 1999; Kao, 1996; Hatch, 1999; Kamoche and Pina e Cunha, 2001) and the competitive world of Haute Cuisine (Bouty and Gomez, 2015; Koch, Wenzel, Senf and Maibier, 2017).

A renewed focus to consider the social dynamics of creativity and can also be found in the network perspectives developed by Perry-Smith and Shalley (2003) and Perry-

Smith (2006) examining how one's position in a network or group can influence creative outcomes, as well as the explicit theorisation of group or 'everyday' creativity in teams (Paulus, 2002; Hargadon and Beckhy, 2006; Carlsen, Clegg and Gjersvik, 2012). Such studies provided a means of analysis which did not necessarily have to return to the creative individual. Instead, these studies focused on the effects of different social ties or formations of groups in an attempt to establish potential positive or negative determinants of creativity, increasingly understood as the collective outcome of such groups. These perspectives in turn served as the basis for further work (Gong, Huang and Farh, 2009; Baer, 2012) including approaches such as Blair (2009), who offered a network perspective of creative work which sought to capture the dynamism and fluidity of networks, rather than treating them "as entities of fixed structure and composition" (p.125). Likewise, Sarah Harvey's (2014) theory of creative synthesis, in which a dialectical approach is suggested in order to demonstrate the flow of creative interactions and their transitions. Harvey, recognising that much of the existing creativity literature has focused on creativity in groups as a random process of variation, instead argued that a Dialectal model better explains how group dynamics inform the generation of creative outcomes.

Despite such improvements, the shared role of techniques and technical objects nonetheless still pass largely unnoticed and unspoken for in mainstream organizational creativity research. How has this come about? Whilst a number of critical studies examining the creative industries and creative labour have raised the prospect of technology, it tends to be in the context of economic constraints (Gulledge and Townley, 2010); or in light of changing technological landscapes (Gill and Pratt, 2008; Pratt, 2009). With respect to how technologies influence creativity

itself (Styhre and Sundgren, 2005a) it must be noted that organizational research has generally avoided examining the creative process (or process of creating) itself preferring to focus on the creative individual or characteristics (Fortwengel, Schüßler and Sydow, 2017). The problem then, is not that theorists have yet to develop and expand creativity research in new directions, but that a vague, uncritical understanding of the creative process which guides many studies may actually preclude it. As Unsworth and Clegg have recently argued, the creative process has not received the attention it warrants in organizational creativity research, resulting in "little systematic understanding of the issues specifically involved with engagement in creative action" (2010, p.78).

Where the actual processes of creating are referred to, it is often under the assumption that creativity is shorthand for the development of successful ideas. For example, building on the four steps of preparation, incubation, illumination and verification proposed by Wallas (1926), Amabile's componential model of creativity (1983,1996; Amabile and Meuller, 2007) states that "the creative process is, essentially, creative cognitive processing of problems and tasks - that is, all the cognitive processes that contribute to the production of the creative work" (Amabile and Meuller, 2008, p.37). This uncritical approach to the creative process perpetuates the classical issues noted previously, separating creativity from its material conditions. It is not difficult to see this at work in modern organizational approaches, already highlighted in Oldham and Cummings (1996) and Woodman et al. (1993). Nor are such views only found the field's early contributions. In a recent state of the science review and proposed framework, Anderson, Potocnik and Zhou (2014), under the purpose of 'integrating' creativity and innovation, define creativity as

simply "*idea generation*", and innovation as "*the subsequent stage of implementing ideas toward better procedures, practices or products*" (p.1298, emphasis in original). With such definitions in mind, it is difficult to envisage a way in which techniques and technical objects can inform creativity, defined as it has been in this anterior manner, except as a determinant acting upon on the separate, creative ability of the individual, or something to be balanced against the creative process itself (Shalley and Gilson, 2016).

Process Perspectives on Organizational Creativity

Such tendencies within the organizational creativity literature have come under scrutiny, particularly from European scholarship less wedded to a psychological outlook (and a positivistic research agenda) than north American approaches (De Cock, 1996). Critics have noted that whilst organizations studies have expanded to consider the social and contextual factors effecting creativity, there has (until recently) been little appetite to consider different ways in which creativity is understood (Montuori and Purser, 1999). The point is well made by Rehn and De Cock (2009), who have argued that:

> Traditional discourses and theorizations of creativity have unconsciously limited its very nature to a set of preconceived ideas, thus distancing 'creativity' as a theoretical concept from the *praxis* of creativity (p.222).

Rehn and De Cock's comments are pitched within a call for greater analysis (and in their case deconstruction) of the assumptions that guide creativity research. Critical perspectives in this vein have also questioned the valorization of creativity within management texts (Prichard, 2002; Osborn, 2003) the obsession with ground-

breaking or radical forms of creativity (Jeanes, 2006; Rehn and De cock, 2006;) the assumption that creativity is always a positive force (Mainemelis, 2010) and the fixation on the genius of the creative individual (Glăveanu, 2010; Köping, 2007). These critical perspectives point towards an epistemological issue in how creativity is defined and understood (Styhre and Sundgren, 2005a). As Rehn and De Cock indicate, the dominant psychological image of creativity is one which may in fact be removed from the *praxis* of creativity, or the process of creating. Rehn and De Cock's suggestion therefore invites us to consider the different epistemological and ontological positions which may be available to help better understand creativity, and thus theorize in a creative fashion (Jeanes, 2006).

In response to this invitation, it must be noted that the field of process organization studies already offers much to creatively re-think organizational creativity. As I have argued previously, the thinkers which inform the field –Alfred North Whitehead, Henri Bergson, and the Pragmatist philosophers- all position novelty as a central feature of reality, as found in Whitehead's *concrescence* (Hernes, 2008), Bergson's concepts of *duration* and the *élan vital* (Linstead, 2014; Bennett, 2010), and the Pragmatist's reimagining of *inquiry* and *habit* (Bernstein, 1971; Simpson, 2017).

What do such positions hold for the study of creativity? For these authors, creativity is something exhibited in human activity, but it so also something more, a characteristic of social, mental, natural and physical life (Ingold, 1986; Joas, 1996; Bennett, 2010, Styhre, 2010) As such, it relates not only to individuals and flashes of inspiration, but to the emergence of novelty (Garud et al., 2015), and how different features of the organizational world are connected, entangled and therefore implicated in creative production.

A process perspective has informed an important minority of organizational studies of creativity, building on the above authors. Chia and King (1998) argue that (in opposition to a metaphysics of substance) to think about organizational creativity in terms of process, it is necessary to understand continuity and change occurring at the same time (see also Linstead and Thanem, 2007). To do so, it is important that focus is directed from outcomes to the dynamic processes which create change. Chia and King offer on the principle of immanence, which, in the context of Bergson and Whitehead, describes how the past is not cut off from the present, but immanent to it: "the present is not merely the linear successor of the past but a novel emanation of it" (p.470). Past events inform present action, but not in a way which renders future action predicable. Thinking that it can is the result of a '*counterfeit movement*' (Bergson, 1992) which occurs after the fact, as the antecedents become clear. However, creative advances do not emerge in flashes which can be traced back to pre-creative antecedents, they are not a "sequence of separate immobilities like beads on a string" (Shotter, 2008, p.502). Rather, novelty is always present and unfolding, as described by William James: "novelty, as empirically found, doesn't issue by jumps and jolts; it leaks in insensibly…for the fatally continuous infiltration of otherness warps things out of every original rut (James, 1910, as cited in Chia and King, 1998, p.461). A similar perspective is presented by Wood (2002), who drawing on Bergson, Whitehead and Deleuze argues against a correspondence theory of knowledge and instead suggests we turn our attention to the "unending flow of forms that have tendency to break out of fixed or stable determinations" (p.160; see also Styhre, 2004). Such thinking is also captured in Styhre's (2002|) use of the AND…,

referring to Deleuze and Guattari's (2004) call to affirm rhizomic connections over the arborescent forms usually guiding management practice.

Authors drawing on a processual outlook have utilised these resources to consider creativity and novelty in relation to different features of organizational life. Hjorth (2004), a key contributor towards the use of process viewpoints in studies of entrepreneurship (Steyaert, 2007) argued that existing organizational approaches to creativity were more closely aligned with managerial strategies to successfully control outcomes. Drawing on an alternative definition (and building on the work of Bergson and Deleuze), Hjorth argued that creativity, rather than a flash of inspiration is "an introduction of the unthought into action as a free movement, as play" (2004, p.415). Hjorth developed this notion of creativity further to consider how space contributes toward the unfolding of novelty, building on Michel De Certeau's (1984) distinction between space/place, and Michel Foucault's concept of heterotopias (Hjorth, 2005) to describe as 'other' spaces which allow for play and invention to flourish.

Building on this view of creativity, Hjorth's later work on the concept of *imagination-fabulation* (2013) extends his critique of both a managerial focus on creative outcomes and the idea that creativity is the domain of great thinkers. Hjorth does so by arguing against the typical creative subject (the very concept of the subject, via Deleuze, being a fiction which stops individuals realising the processes of individuation which precede and pre-empt the subject; Deleuze, 1991, Deleuze and Guattari, 2004) in favour of considering the different forces (also referred to as *fields of intensities*; see Hjorth, 2013, p.217) which inform an ongoing process of becoming (Tsoukas and Chia, 2002). Hjorth argues that through an understanding of

the potentials offered through *imagination* (defined as an inventive power of thought which differs from reason) and *fabulation* (the putting of imagination to use, such as in storytelling and fiction) we can better understand the process of *subjectification*-specifically for Hjorth, that of the process of becoming a creative entrepreneur.

In a similar vein to Hjorth's approach, recent process based studies have also expanded organizational thinking to provide a more nuanced description of imagination out with a narrow focus on individual creative ideas. As initially suggested by Chia and King (1998), Komporozos-Athansiou and Fotaki (2015) build upon the work of Cornelius Castoriadis to present a theory of imagination. In Castoriadis's ontology, the imagination is characterised by two processes: "a creative instituting *process* emerging from the mutually constituted relationship between the psyche and socio-historical forces, and an imagined, instituted *outcome* (denoting the given organizational form)" (Komporozos-Athansiou and Fotaki, 2015, p.325). The authors discuss how these two aspects unfold and can be better understood through Castoriadis' use of three guiding concepts of *representation* (the creation of images), *signification* (the creation of meaning) and *affect* (through which psychical life is connected to the political and social). As a contribution towards a broader understanding of creativity in society (particularly in the formation and maintenance of its institutions), Komporozos-Athansiou and Fotaki also highlight its value in challenging representational/ nonrepresentational, mind/body and private/public dualisms. Imagination is also invoked by Thompson (2018), who argues for a relational understanding. In light of theoretical developments, particularly practice-based studies focusing on the site of the organization (Schatzki, 2006), Thompson suggests that current theories of creativity "are ill-equipped to envision the human

mind as more social, more interdependent and more embodied than currently realised" (p.230). Thompson then argues for a relational understanding of imagination, which also seeks to account for the aesthetic dimensions of organizational practice (Strati, 1999) by developing insights from English Romanticism. Specifically, Thompson argues that Imagination can be thought of in terms of a primary capacity (an active subconscious which blends information about the world together) and a secondary capacity (the conscious act of forming something from the primary suggestions) which are shared through a process of creative expression.

Closer to the area of technique and technical objects, there have also been some recent useful interventions into considering creativity in relation to technology materiality. In similar fashion to the works drawing on the concepts of agency and association raised in the previous chapter, these works draw a processual perspective, focusing on how the material affordances offered by objects (Shotter, 2013) and artefacts (Gherardi and Perotta, 2013) reveal opportunities for creativity. Likewise, Styhre and Sundgren (2005a), building on their prior accounts of creativity, intuition and innovation (Sundgren and Styhre, 2003, 2004; Styhre, 2004) offer a process reading of creativity and technology, arguing (in a similar vein to Chia, 1999) that technology (specifically technologies of representation), rather than simply driving progress are instead caught up and socially embedded assemblages of humans and technical objects. Styhre, drawing upon Simondon, further extends his analysis of such assemblages via the concept of *transduction*, which "means any process, "physical, biological, mental or social" (Simondon, 1992 p.313), in which metastability emerges" (Styhre, 2010, p.119). There have also been notable works

which have explored the indeterminacy[1] of the creative process opening up practices to the possibility of serendipity (de Rond, 2014), the variability of tool use (Suikonen, 2010) and the potential for uncovering the inherent vibrancy of matter (Malafouris, 2008; Ingold, 2009; Bennett, 2010).

To conclude this section, a process perspective therefore offers the critical onto-epistemological tools to reconsider the dominant psychological perspectives which have typically characterised. In what follows, I consider the specific issues apparent in psychological studies, from the viewpoint of technique and the insights offered from these process perspectives.

Technique and Creative practice in Organizations

Having reviewed both organizational and process accounts of creativity, I now return to the matter at hand: How to address the disjunction between organizational creativity and the study of technique. I do so by highlighting three critiques of current approaches, and suggest the means to move beyond them. First, I identify the problematic relationship with technical objects and the material world in the study of organizational creativity. Second, I challenge the tendency in studies of organizational creativity to begin analysis with the finished product, which ignores the technical processes of creating. Finally, I identify the third problem of attributing novelty itself, which relies on social or expert judgements. This vision of novelty is one which can only operate in the social sphere, relying on a backwards reading of the creative process, and offers little to explain how new things may emerge. I

conclude by considering the overall effect these problems have had on the direction of creativity research in organization studies.

The Missing Masses

As the review of the literature has shown, the role of techniques and technical objects in general has been under-theorized in studies of organizational creativity (Miettinen, 2006). Whilst the direction of creativity research in organizations has developed in a variety of different directions from initial models attempting to establish determinants of individual creativity, it has yet to fully explore the "creative situation" proposed by Amabile. This is due to a particular view of the nature of the creative process. As Glăveanu notes, it is not that creativity theorists are unaware of the material world, but rather due to "a common belief that idea generation is at the core of creative performance and ideas reside in the mind, not 'outside' of it" (2014, p.49). As a first step towards addressing these issues, it is therefore necessary to replace this perspective with a process worldview in which technical objects and techniques are held to play a part in the process of creating.

Returning to the Atlas and Helios studios, we may begin by adopting a critical position towards the view that creativity is an anterior process of idea generation separate from the technical processes of implementation or making (Gherardi and Perotta, 2013; Ingold, 2009). To assume this view is to detach ideas from the contexts and conditions of their formation, a view which not only leaves ideas free floating and undetermined, separated from their relational context (Thompson, 2018) but also reduces the generative processes of making, undermining them to the status of mere production. This separation of creative design and everyday execution

diminishes the *tekhne* of creative production and making (Ingold, 2000), and is also a view which finds itself out of sync in a world which is ever more influenced by technical objects. The resulting image, Latour argues, of "a human being at the helm manipulating inert objects to achieve ends through the intermediary of 'efficient action on matter' appears increasingly muddled" (2002, p.248), as the ability to separate human affairs from their technical surroundings becomes ever more suspect. A more productive approach is, I argue, to instead redress the balance of forces found in the creative process (Wood, 2002), beginning with technical objects, techniques and their relation to the generation and implementation of ideas.

In the Atlas studio, creative idea generation and mechanical implementation were more regularly supplanted by blurred practices in which these two processes found themselves interlinked. Take for example, the early stages of a project to design new storage for the designer's growing collection of machinery. On this particular occasion, Peter is busy sketching shapes using Computer-Aided Design (CAD) software. Eager to know more, I ask him what he is working on:

[*In the Atlas studio, I am observing Peter using CAD software to design two new benches for the workshop. At this stage the designs are simple 2D sketches, which will be milled out of wood at a later stage*]

> **Rory:** *"So what is it you're designing, what's the brief?"*
>
> **Peter:** *"these are two new benches to hold machines, for the studio, running parallel to each other, in this space"* Peter responds, pointing to an area of the studio floor.
>
> **Rory:** *"which machines are they going to hold?"*

Peter: *"They're going to sit over by those two columns and behind these two columns,"* he replies, pointing to a supporting column*, "basically replacing that bench and have the two new vinyl cutters over there. So, this one's going to have 3D scanning on it and vinyl cutting over there."*

The plan to replace the current storage had been conceived at a previous point, primarily between the technician Peter and the head of the studio, Paul. Peter continues to describe his plan:

Peter: *"So we've already discussed it's going to be 900mm high, so about that high, so you've got good access into it, they're not going to be that deep because they don't need to be, they're literally holding a machine, so that's going to be the same depth as the current flight cases, so I've started very simply by drawing those (Peter turns to the CAD program to explain the dimensions, pointing to the screen) that's 900mm high, that's the space between the two columns, and that's an elevation so that the front view, that's the top view of the space I'm working with. So I'll now start to design it because we're going to bring these out a bit (referring to the top layer of the shelf) and they're going to be in two sections, and it's going to have a slight overlap on it, so I'll just start making spaces, offsetting that, I thought maybe we could do it in an angular or a curved surface…so…"*

Thanks to Peter's familiarity with the software and its ability to rapidly produce shapes, he quickly reaches the stage where he can begin to experiment with a base model. I ask him to repeat the process, which he describes as he works:

Peter: *"so that's the really basic front, as simple as we can do for that space, and then we want to have two different benches, split them in two, and then we want to have a bit of an overhang on the bench, so I already know I want it to come out about that far, and then look to see how we would do that in a stylish way, so we may try a triangle (Peter clicks and observes)… doesn't look very good, let's try again, experiment with shapes, there's a curved shape, maybe that works, maybe it won't, so I'll play around with spaces…*

Within this brief dialogue, it is already possible to observe the different technical aspects influencing the process of creating which will eventually give rise to a finished product. As Suchman and colleagues note, to observe techniques and technical objects such as this in the making, is to observe a "*practice of configuring new alignments* between the social and the material" (2002, p.164). In this particular instance the CAD software is now acting as the medium through which Peter and Paul will begin to align their ideas and the materials into an end product. Along with the base model laid out on the software, the potential space in the workshop and the existing layout each present further considerations, which the designer must weave together in his solution.

Peter is a different designer with the software at his fingertips, taking on its properties as he generates variant forms through the software. Peter continues to experiment with alternative shapes as potential surfaces for the top of the cabinets, which I comment are beginning to take on more complicated geometric forms:

> **Peter:** *"yeah just seeing,"* Peter responds, *"the idea is these two are free floating* (pointing to the two cabinet surfaces*), so you could put either on the other side, with a gap in the middle, and set a chair in the corner, or the other way, I'm not quite sure, so I'll probably, at this stage I'll play around with these shapes for a while, see what I come up with.*

It is clear Peter knows what he is doing, "seeing" (Johnston, 1999) through the software how the different shapes will likely fit alongside one another. I am curious however, to discover to what degree these shapes have been planned, leading me to ask:

> **Rory:** *"When you discussed this earlier was there any idea of what sort of shape it would be or…?"*

To which Peter replies:

> **Peter:** *"We kind of discussed it would be coming out in some way, yeah so, we didn't discuss what that would be, or how that would manifest itself, so, it may be something like that, (points to screen), not really sure. Also, I don't want to make it, the problem with this, rather than a simple square is that it can become...or what's cool this week might not necessarily be an interesting shape next week so, you kind of almost want to go either square or very rounded. It might even be that, it might be as simple as that."*

As Peter has suggested, the idea to build something to house the machinery has already taken place. This stage however, is the beginning of the idea's involvement, not the end. Rather than a form conceived in advance and waiting to be laid down in a linear input-process-output model (Wood, 2002; Czarniawska, 2008), the designer's attempts to realise the idea undergo a process of experimentation via the technical assemblage he has at his disposal. At this point, it appears as just one of a number of forces which may ultimately drive the direction of the project. Peter continues to explain some of the technical aspects of the design software and how the design relates to what will eventually be an end product. Tinkering with the lengths of lines, the shape of the surface and the method for installing racks within the cabinet, he comments:

> **Peter:** *"A lot of this is about trying things, to see if they work, to see if they fit together, and if it doesn't, then try again. And sometimes this, sometimes the construction dictates the design; sometimes the design dictates the construction, whichever fits the purpose better."*

Interested by this back and forth between the design and the construction "dictating" the process, I ask:

Rory: *"And are you always, do you think when you're doing this you're anticipating what it's going to look like in real life? Or are you just focused on the geometry of it?"*

Peter: *"well,"* Peter answers, *" I know what this style's going to look like in real life so I'm happy that my geometric shapes will work out in real life, so originally, a lot of thought was to look out how these are placed and how they come about and I'm confident I know the finished article will look the way I want it to look,*

Peter continues to adjust various dimensions on the program until he reaches a certain point, and pauses temporarily, saying;

Peter: *"So I'll suggest these to Paul, he'll say he doesn't like it, then we'll start again"*

Peter laughs, suggesting his comment was only half serious and clarifies:

Peter: *"So before I go much further ill see what the group decides"*

Whilst the creative action thus far has centred on Peter and the CAD software, it has also been framed by an earlier discussion with Paul, which Peter is attempting to extend through the program. The software itself also dictates what can be created, allowing Peter to quickly draft a representation of the previously discussed design. The final joke also indicates that the creative process is far from finished, as we observe when Paul arrives to assess Peter's design;

Peter: *so there's that one, or do you want to do it more like a stocked housing, it comes up flush…*

Paul: *I think… continue with the same aesthetic as these, (*pointing to another item designed in the Atlas studio*)*

Peter: *these?* (Pointing to the desks)

Paul: *yeah,*

Peter and Paul work their way through the design, discussing what dimensions are required and what method will be employed to put it together:

Peter: *what do you think about the top?*

Paul: (hesitates slightly) *yeah…*

Peter: *just a continuous curve*

Paul: *let's not do it a curve, take it flat across there and chamfer it,*

Peter: *I was trying to do that but I wasn't getting anything I was happy with.*

Paul suggests a series of measurements to achieve a chamfered (a smooth sloping cornered edge) finish to the surface, and after a few adjustments, they begin to arrive at a shape they are happy with:

Paul: *I think that's going to look a lot better than, yeah; I would say that, definitely not curved. Cause then if they go the other way, then you have a sort of inset bit as well, that could be quite good.*

Peter: *would you… like a z shape? Bring it in 200mm? Like that? And when they do sit together you don't have that really pointy bit?*

Paul: *yeah, you could do that*

Happy that a suitable solution has been reached (fig.5), Paul leaves Peter to continue with the design, which still needs some refinement. At this stage in the creative process, the initial idea has gone through a number of generations, which thanks to the technical medium of the CAD software has proceeded at pace. As Peter continues to work, I begin to notice that some of his designs are being used in different ways. For example, some are held in place of Peter's memory of his original interpretation of the brief (see the 'bubble' in fig.6), whereas others represent his current progress. Interested to know more, I ask:

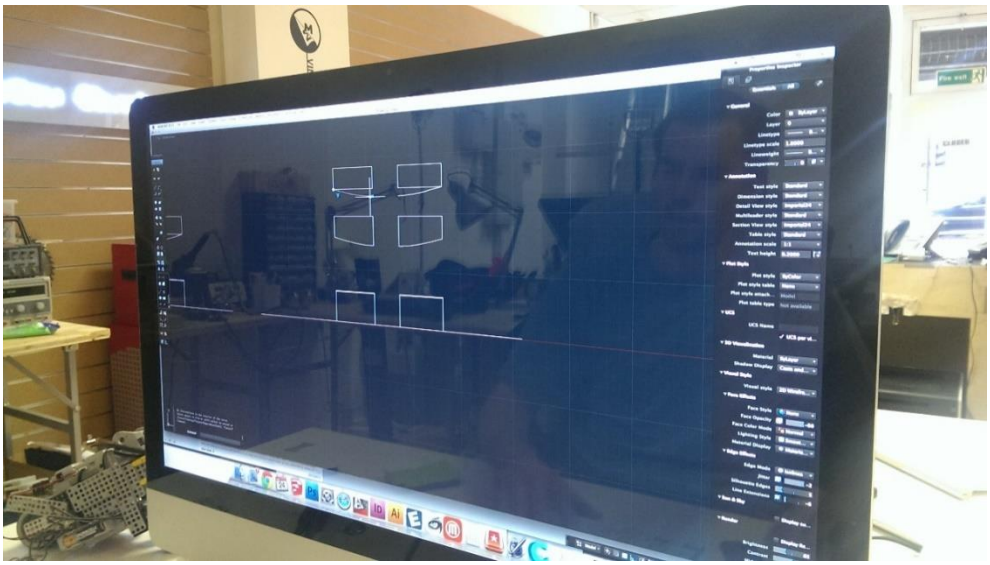

Figure 5: Peter sketches the surface edges with CAD software

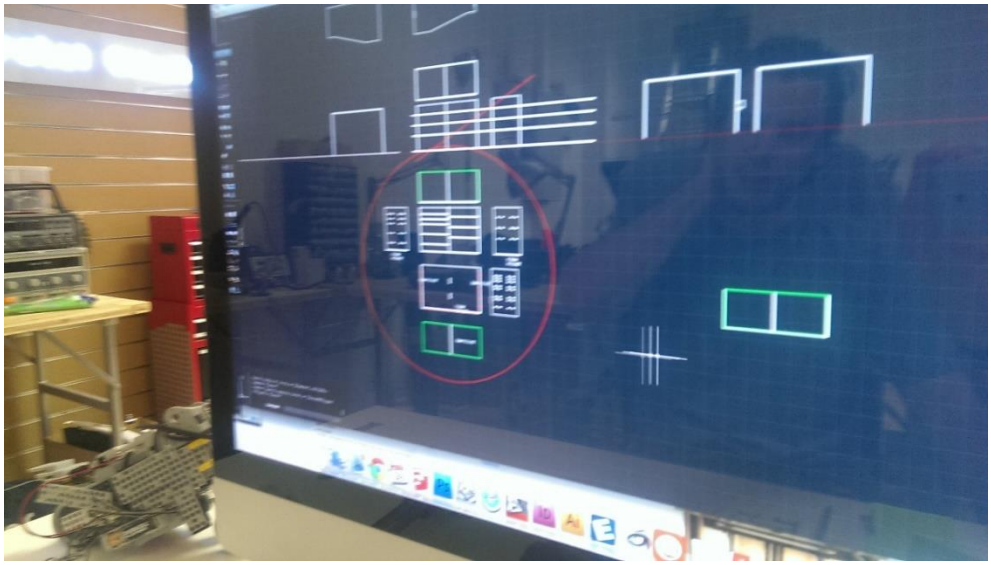

Figure 6: Peter's Bubble and scored out drafts

Rory: *"Why did you put a red line through it?"* noticing one of the earlier deleted designs had re-emerged with a large red line cutting through it

Peter: *"well,"* Peter replies, *" it's useful to have that still there, I've changed the design from what it says there on the screen, and originally I did go back and delete it, but having it there is useful if I need to go back and check, it shows me where the design's developed from, and how I've progressed to the next design…the fault lines are just there to signify that its old so I don't get confused, cause it is different from the one I'm doing now, so I don't want to mix the two designs. Quite often what I'll do is I'll work in bubbles, now that I know that that one's correct, I'll put that in a circle."*

Much like Frank's descriptions of using folders to organise his thoughts in the previous chapter, we find that in the process of creating, technical objects do more than assist in mechanical implementation (Latour, 2005b). Rather, they find themselves wrapped up in creative action, offering different capabilities and forming different relations. Peter, who has developed his own particular way of working with the software to assist his process, highlights the reasons why it should be considered reductive to treat idea generation as separate from implementation. Indeed, examining this scenario, it seems odd that so little consideration is given to the role of technical objects. It also becomes clear that the psychological perspective leaves little room for this sort of technical improvisation, for serendipity to creatively emerge from actions which are not quite intentional or causal (de Rond, 2014) or for designers to follow the materials intuitively and see where they lead[2] (Ingold, 2009; Malafouris, 2008).

Building upon the argument in chapter three for the consideration of different agencies, it hopefully becomes clear excluding them from analysis in creativity results in an imbalanced view of the process. For Simondon, this exclusion

"corresponds to the knowledge [*connaissance*] of someone who stays outside the workshop and only considers what goes in and comes out of it" (Simondon, 1960, p.40, as cited in Protevi, 2001, p.8) rather than the generative processes themselves. Such an imbalance also makes the case for considering other modes of understanding creative practice, as a strictly abstract or analytical inquiry is likely to result in similar mistakes, never addressing the question of what it means "to work and think with a tool" (Siukonen, 2010, p.281).

This is a view shared by Latour who makes a similar point, arguing that "those who believe that tools are simple utensils have never held a hammer in their hand, have never allowed themselves to recognise the flux of possibilities that they are suddenly able to envisage" (2002, p.25). These views question both the exclusion of technical objects and the reduction of technique to the domains of instrumentality and efficiency. As Peter's work demonstrates, different techniques entail the making associations with different agencies (the designers, the software, the studio) affecting the creative actions undertaken. Ultimately these actions are not so easily separable into human and machine or even into design and execution, but instead are rather all enrolled in the hope of achieving a creative aim.

Peter's example serves to highlight once again why techniques and technical objects should not be excluded from analysis, as a great deal of organizational life is essentially wrapped up in their operation (Engestrom and Blackler, 2005). Combining the presence of techniques with creative ideas however, presents a challenge to organizational theories of creativity, which as a result of their neglect of techniques and technical objects can present little more than a skeleton of the real affairs which constitute the processes of creating. Examining creativity from the

perspective of techniques highlights a particular flaw in organization creativity's composition of its own object of study, which, through its theoretical commitment to a creativity which precedes implementation, problematizes the technical and the material.

And yet, despite their almost total absence from the organizational theorists' views on the processes of creating, objects do provide some value to organizational studies of creativity. Although objects are not held at present to impact the creative process, they do provide evidence of its presence. Paradoxically, creative products or outcomes are highlighted as one of the clearest indicators of creativity (Amabile, 1996). The question must then be asked, why can objects, excluded from the creative process, then represent it at a later stage? To answer this question, it is necessary to examine the ways in which objects of production find themselves representing creative process as creative outcomes.

The Ends of Technology

The role of creative products or outcomes as an indicator of creativity deserves much more critical scrutiny than has been applied to date. Its influence on organizational studies of creativity can be traced back to Amabile's (1983;1996) seminal work, which recognised that although the implicit focus of creativity research is often the individual, most explicit definitions of the concept rely on the creative product to determine the presence of creativity. Amabile's theory was eager to make the connection between creative products and a general phenomenological experience or

shock of the new[3] (Bruner, 1979) as previous attempts to define some global criteria of creativity in individuals had been unsuccessful. Whilst Amabile avoided any objective criteria which could be applied to determine a product's creativity, she did base her theory on a method of subjective judgements for creative products or outcomes. This decision, according to Amabile, could be considered necessary as "the identification of a thought process or sub-process as creative must finally depend on the fruit of that process- a product or response" (1996, p.33), and thus developed an ex-post psychology which could establish agreement between experts on the creativity of products and outcomes. Subsequent work in the field of organizational creativity has adopted a similar logic, with studies relying on an ex-post certification from either the participants themselves or their superiors (Shalley and Zhou, 2008; Oldham and Cummings, 1996; Ford, 1996).

The unintentional fault with this approach, visible from a process perspective, is that it assumes that creative ideas *simply become* creative products, and that the technical processes which occur in between do not warrant inquiry.[3] For organizational theories of creativity, creative ideas are implemented, and the resulting outcome or product directly corresponds to that idea, denying the different assemblages and associations which connect to create the new (Chia, 1999; Wood, 2002; Latour, 2005b). To admit otherwise would, in one sense, be to undo a considerable amount of research which has unthinkingly connected creative outcomes to antecedent factors, and risk opening the black box of technical process in which products and outcomes are actually created (Akrich, 1992). In keeping with Simondon's aforementioned allusion to the workshop, organizational theories of creativity attempt to connect what goes in to what comes out, without ever examining what

happens in between, obscuring the Daedalian manoeuvres to be found within. As process scholars in particular have noted of this kind of theorising, breaking up processes to inputs and outputs and leaving the middle area of action unattended presents its own problems for understanding how organizational life operates (Chia, 1999; Czarniawska, 2008). In the case of mainstream theories of organizational creativity, such problems are pronounced, yet largely overlooked.

A further issue with relying on the creative end product or outcome is that, by excluding the material and technical aspects of the creative process, analysis can only begin after the product or outcome has been created. This leads us into some thorny methodological distinctions. Reliance upon end products may lead, in the case of Margret Boden's work (1992), for example, to a distinction between what is personally (P-) and historically (H-) creative. As Ingold (2014) notes, when asked to compare an idea against historical works to determine its novelty, a paradox emerges: as we are forced to consider the idea itself as outside of history. Rather than an account of the processes of transformation which lead to the idea, history then becomes a list of innovations to compare and check off against. As Ingold and Hallam previously noted in a collection of essays examining creativity and cultural improvisation, to liken creativity solely to the novelty or success of its output is to equate it to such an historical innovation. Furthermore, to read creativity as successful innovation, they argue, is to read creativity backwards, "in terms of its results, instead of forwards, in terms of the movements that give rise to them" (2007, p.3).

H-creative ideas then, are themselves strangely a-historical in nature, as they can only be attributed to the individual mind, which is therefore "on its own, effectively

cut off from the world of persons, things and relations, in which it necessarily subsists" (Ingold, 2014, p.125). Whilst to separate mind from world in this manner is clearly an antithesis to a process perspective (Cobb, 2007; Komporozos-Athansiou and Fotaki, 2015; Thompson, 2018) Ingold argues that this is primarily an issue of direction: for "only when we look *back*, searching for antecedents to new things, do ideas appear as the spontaneous creations of a mind encased in a body, rather than way stations along the trails of living beings, moving through a world" (2014, p.128). This error in thinking bears much similarity to Bergson's challenge of the so-called 'retrograde movement of truth', in which the present, casting its shadow on the past, "seems to have been pre-existent to its own realization" (1992, p.22). As Ingold argues, this is not case, and in both accounts we find a similar risk in looking backwards, seeing only the possibilities apparent the present, and overlooking the continuous novelty which, being emergent, is never totally foreseeable.

A backwards reading of creativity then, which begins with the finished product, ignores the formative processes of its making, and fosters an imbalance between design and execution which, as I have suggested earlier, not only degrades the role of technique, but also encourages a disconnection which alienates the creator from both the created product and the process of production. The alternative, is to read creativity forwards in terms of the generative processes which give rise to finished forms (Ingold and Hallam, 2007; Ingold, 2014), rejecting both the need to begin research with end products and the separation which necessarily occurs in doing so.

Following the previous example of Peter and Paul, I return to the empirical analysis to consider the practical impacts of direction in the reading of organizational creativity. One such difficulty, highlighted through Peter's work processes, is that if

ideas are seen to be more important or separate from their implementation, both the material world and technical activity are left neglected (Miettinen, 2006; Glăveanu, 2014). This problematic relation between creative ideas and their execution was found to further manifest itself in the designer's practical experiences of 'designing' and 'making', referring to the so called 'maker movement' (Dougherty, 2012); a movement which is largely held to propose an alternative viewpoint to the traditional images of innovation and invention.

Embracing this movement, designers in the Atlas studio often sought to emphasise the material implications of design and manufacturing processes, and the form-finding benefits of technical engagement. Sarah, for example, had been attempting to develop alternative uses for waste products created by the various processes undertaken in the Atlas studio. I first became aware of Sarah's interest in doing so when attempting to fix one of the 3D printers, which, due to both the fragility of the plastic and the heat involved, were notorious for jamming or producing unsatisfactory end products. As I sat with Sarah while running a test print, she offered her opinion on the process:

> **Sarah:** *"I feel like 3D printing is sometimes a bit wasteful, I especially when sometimes you're just printing something rubbish… I don't really like it, so I try and design things that are a bit more useful, like things that give products that are going to waste a second life, like I've seen people give jam jars…turn them into watering cans and stuff, reinventing screw tops for them, that's pretty cool."*

I agree, as Sarah considers other possibilities:

> **Sarah:** *"or like, if you could do that with plastic juice cartons or something that would be quite cool, because I feel like a lot of the time people just come*

in here and print stuff off … I mean I'm doing that right now but it's just a bit wasteful, it's not a revolution where it's going to empower people, it's just people printing toys"

In the previous example I sought to highlight that ideas are not separate from their environments, but rather always in dialogue. As Ingold writes, "(i)deas, too, have lives. They don't just pop up, ready-formed, from nowhere. An idea is like a place you visit…Each time you revisit the idea it is a little different, enriched by the memories and experience of your previous stay." (2014, p.127). In Sarah's case, it is an ongoing experience of making and helping others to make new things which drives her process of creating. As she suggests, her issue with 3D printing is that it is often used in a wasteful, impractical manner, enforcing a belief that the material world is expendable or that re-use is unnecessary. As a creative response to this, Sarah is attempting to engage with the technical possibilities offered by 3D printing to offset the damage such a mind-set has on the material world. Discussing the potential for renewing or recycling waste products, Sarah continues to describe another of her own attempts, dealing with waste cardboard (fig.7):

Sarah: *"I was trying to, have you seen we've got loads of cardboard packaging through the back…I was trying to pulp that and paste it into different things, it's quite a different, difficult process, I looked it up online and you have to have a really strong vacuum and make a mesh mould and then basically suck the soggy cardboard into the mesh mould so I just need to get all the equipment to do that, but I just tried like pressing it into a mould shape but it never dried, it just stayed a big soggy mess for ages, I think the vacuum basically sucks all the moisture out as well yeah.*

Rory: *"Good thinking though"* I respond encouragingly, as we continue to discuss the different possibilities;

> **Sarah:** *"yeah I know, I'd like to think of a really useful application for that, like the idea of being able to print your own parts for things because so many things I've taken to get repaired, like to electricians and stuff, and they always just say, it's cheaper to get a new one, and I hate that, I am prepared to have this fixed, rather than buying new one, because I don't want to be wasteful, and so they just won't even try, so if you know if you can print, if your washing machine needs a new like part or something that would be really cool, but the standard of this machine, it's not going to be able to print parts like that…"*

Here, Sarah is practically engaging with spare materials and exploring different techniques, from which a creative solution emerges (fig.8). In this case, it is a willingness to engage with the existing materials and form new associations, to enter into new assemblages which spurs the attempt to create something new (Chia, 1999), with the idea emerging from technical practice rather than being antecedent to its environment (Ingold, 2000). The view that the idea takes some form of precedence is, for Sarah potentially hazardous for the creative process, and also for the act of 'creating well', particularly if the technical process of formation is treated as a simple or forgone conclusion:

> **Sarah:** *"well I think for people that haven't done design before, which is a lot of our customers they don't realise the value in it, they come up with an idea, and they expect us to be able to make it first time and for it to be perfect or for them to make it for the first time and to be perfect, and they get frustrated when it's not. …people just come to us with a vague idea and expect us to make it straight away. To make something that's actually good you need to test it over and over again, and keep making it and trying it until actually get something that works…and you can take that to your users …it's something people can engage with, it's almost a tool for starting a conversation. And it's a really valuable thing to do,*

> *"it's a really creative process, you come up with new ideas through your prototyping, that's what, you know just sitting at a screen trying to draw a final product, from an idea in your head, is impossible. That's not going to happen. You need to have something in your hands to play around with and when you see that "oh, this handle doesn't work," you can start to play around with a lump of foam or something and make one that does work…I just think it's essential, without it you can't come up with anything new."*

As Sarah's comments highlight, the tendency to backwardly work from creative product to a single creative idea results in a view that technical experimentation has no value. The important stage for the designers is to see their already complete ideas come to fruition, without recognising that in the process of creating that same idea may meld with the material and technical to become something different (Sennett, 2008). Considering these successive stages of generation and the possibility for change within them, I suggest it would be more accurate to say that such initial ideas are so open to different routes taken to achieve the final product, they more closely resemble a guiding direction than something to be implemented, a single force amongst many others (Ingold, 2014). To try and work from the initial idea straight to its uncompromised execution then, as Sarah argues, is an impossible task.

Figure 7: Waste cardboard for Sarah's recycling project

Figure 8: First attempt at reforming pulp

Eager to know more, I ask her to further elaborate on the matter:

> **Rory:** *"Why is it that someone can't just go straight from the idea to the final product?"* I ask, as Sarah pauses to think, *"Is it because it hits with real world problems?"* I suggest;
>
> **Sarah:** "*Yeah,*" she replies, *"like physical problems as well, they'll have an idea in their head, then they'll pay thousands and thousands of pounds to have it manufactured, probably in china, and it'll come back and it'll be like "oh, that's really uncomfortable, I can't even fit my hand through there, actually this is a totally useless, pointless piece of plastic I've just paid loads of money to have make. If you can't physically hold something, you can't assess its usefulness, I think."*

Sarah's description of the necessity of technical experimentation further supports the view that separating design from execution can lead to difficulties. Returning to a previously discussed aspect of this divide, it also appears that a conflation with the technical and the mechanical helps sustain the view that creativity involves ideas which can be implemented separately (Ingold, 2000). As the failed products in Sarah's examples show, mechanical implementation may hold for existing, tried and tested objects and designs, but it is a logic which does not conveniently apply to creativity. Realising an idea is a technical and creative process, rather than a mechanical one. Unfortunately, when creativity is read backwards it is also held to be separate, resulting in the aforementioned distinction between designers and makers, a distinction I put to Sarah:

> **Rory:** *"Do you think then there's a distinction to be made between designers and makers? Are all designers makers and makers designers?"* I ask:

> **Sarah:** *"All designers definitely aren't makers,"* Sarah responds. *"Designs such a big term you know, like graphic design, they never make anything, although I suppose you could say "make" they're making a website, and I suppose maybe they probably prototype their website as well, they probably prototype the layouts that they're doing, so maybe it depends what you mean by the term make, a lot of designers I don't think are makers though, like a lot will just sit at screens and drag things around and draw things…I think all makers are designers more than all designers are makers* .

Interestingly, Sarah's indecision on what exactly constitutes 'making' suggests that the difference between designers and makers is ideological rather than technical[4] (Simondon, 2017; Protevi, 2001). It would not be the case, for example, that those using design software are automatically designers whereas those engaging with different woods or metals are makers, as her consideration of graphic designers confirms. Rather, it is the view that the idea is separate and superior to its implementation, the architectural design against the manual execution, and the removal from the technical processes which it engenders which Sarah appears to dislike. For what she finds in practice is the cost of this ideology, a focus on ideas which hides both the potential offered by technical engagement and the necessary pitfalls which could lead the idea into different directions. Without a consideration of the technical processes of making, pressure for the success or failure of a project then rests squarely on the shoulders of the designer, who if the idea is good is celebrated, and if not is ignored or forgotten. Tom, a designer using one of the workspaces in the Atlas studio, was particularly wary of this sort of thinking:

> **Tom:** *what worries me is the design culture we've got in general is very on treating design heroes, the sort of Jony Ive type thing, based on personalities or like "I came up with this". And there's a funny corollary to the intelligent*

design thing, the creationism thing, the idea that God was an intelligent designer that made the universe, opposed to evolution processes, which generate the things which emerge from them. The same could be true of design, like our design, normal culture of design (laughs), are there any intelligent designers? Are we intelligent enough to deal with the complexities of complex systems and modern life? To be efficient, energy resource efficient, and all these things, maybe we're not intelligent enough to do that, you know, the terms of design came from the natural world having a kind of personality behind it, but then our idea of a consumer product having a personality behind them, maybe that's wrong as well. I've been trying to think more, you're setting up these systems, tools, simulations, I don't know the word, and physical prototypes, to and your role as a designer is maybe more of a gardener, to tend,

Rory: *"I'd heard you say that…"* I respond, recalling a promotional video in which Tom had referred to the changing the role of the designer as *"less the egotistical diva, and more the mentality of the gardener, pruning, patient, and setting the right conditions for growth"*. At this point, Tom begins to consider how this changing viewpoint of design influences his own practice;

Tom: *but this is the thing, it's good for me to say these things out loud because I'd tried to say things in that video as well, I'm trying to find ways to talk about it, and I haven't, cause it's all gut feel, you work with different people, you work on different projects, and you see what, and then you start to try and work out, what it is you mean…*

As Tom suggests, reducing design to "I came up with this" may place an expectation upon ideas which the designers cannot sustain. In a manner reminiscent of Latour's crisis of the modern world's inability to deal with the proliferation of hybrids (1993), it may be the case that the designer's ideas alone are not sufficient to solve the issues they face. Yet these expectations have been placed upon the designer via a backwards reading of creativity, which, having waited for an object to be deemed

creative, has looked back and wrongly determined it to be the sole result of a fully formed idea prior to its conception in the mind of the individual. Rather, the designer, in the midst of techniques is only once force among many, passing through a series of "personal or collective individuations" (Hjorth, 2013, p.215; Simondon, 1992) which inevitably change the direction of the creative process.

To work from a finished product back to the idea, as found in mainstream organizational theories of creativity, is to wrongly place the idea (and the individual creator) above all else. Reading the creative process forwards, it is clear to see that the idea is just one of many different elements – perhaps the catalytic element- but nonetheless one which is altered by its encounters with the material world and the techniques of those who inhabit it. There is however, one pervasive element which allows the current state of affairs to steadfastly retain their position in studies of organizational creativity. The backwards reading of creativity, despite the flaws I have sought to highlight, does provide a means of establishing the agreed novelty of a product. Therefore, in order to overcome it, the question of novelty must be considered.

The Judgement of Novelty

Although the limitations of backwards, ex-post assessments of creativity in organizations should be clear, there are reasons why it remains the method of choice: reasons which must be addressed if it is to be overcome. The issue lies, I believe, with the desire to judge creative outcomes. When praising either people or products as creative, it is generally in recognition of some form of newness or originality (Barron, 1955; Amabile, 1983). As Gregory Feist notes, a high degree of agreement

actually exists between researchers that the concept of creativity should be defined as "both novel-original and useful-adaptive" (1998, p.290). I have noted at the beginning of this chapter that 'new and useful' definition has also entered into general usage within mainstream organization studies (Amabile, 1988, Woodman et al. 1993, Oldham and Cummings, 1996, Perry-Smith and Shalley, 2003; Harvey, 2014), and aside from two notable exceptions which challenge or discard the "useful" aspect of the definition (Drazin, Glynn and Kazanjian, 1999; Driver, 2008) this viewpoint represents the typical position. However, though many are in agreement that creativity should represent some degree of novelty or usefulness, and that identifying it would certainly be a useful step in cementing the processes of creativity and innovation, there is less clarity on exactly what criteria would allow us to achieve such a thing. How exactly do we know something to be new and useful when we see it?

Once again, organization theory has largely relied on the logic of Teresa Amabile's social psychology of creativity (1996) to navigate such difficulties. Amabile's strategy for developing a method for a social psychology of creativity capable of assessing novelty can be understood in three steps, for which I shall briefly pause to identify. Firstly, Amabile introduces the use of subjective judgements for assessing creativity. For Amabile, much of the previous creativity research, despite purporting to offer an objective analysis, could not in fact claim to be so, due to the outcomes of creativity tests being based on the judgements of the test administrators (Guilford's unusual uses test being a case in point). Amabile therefore suggested that any judgement of creativity "can ultimately only be subjective" (1996, p.28). This view, although at odds with other attempts to sidestep the criterion problem at the time[5]

finds some precedence in the literature. Frank Barron (1954) for example, had previously argued that the concept of originality was purely relative, that "acts are original only in relation to some specified commonality" (p.478), providing some credence to introducing subjective judgements. The difficulty in giving priority to subjectivity however, was that creativity could not be theoretically defined in a satisfactory manner, as it would lack the basis for consensus and would also fail to meet Amabile's own requirement of being able to generally distinguish between creative and non-creative production.

Amabile's response to this difficulty, and the second step in her revision of creativity as a social psychology, was to adopt two definitions; one which would allow for empirical research based on expert judgements (a consensual definition), and one which would allow for theoretical development based on suggestions regarding the relation between such judgements and the nature of creativity (a conceptual definition). Amabile's final step, as I have discussed, was then to suggest that a theory of creativity following these proposals should focus on the creative product, the most likely aspect to yield agreement from judges (via measurements of inter-rater reliability).

Amabile's theory, though successful in at least suspending the criterion issue and allowing a program of organizational creativity research, must still provide an answer the question of *how* we can recognise something new when we see it. The question is particularly pertinent to Amabile's approach, given her reliance on expert judgement, yet it is in this area that some form of conceptual development is required. A justification for her approach outlined above is based on three assumptions (1996, p.34); firstly, Amabile assumes that although outcomes are in

some way linked to creativity, objective criteria cannot be defined a priori, as they are culturally and historically bound. Secondly, although phenomenological responses to creative products may differ, people can recognise (and agree) on creative outcomes without being provided with a definition, and finally, that there exists degrees of creativity which can be recognised in products (p.34). Based on these criteria, Amabile's theory assumes that the ability to judge is both possible and correct. Within Amabile's method and definition, not only do we find a series of challengeable propositions, but also a political choice steered towards the judgement of creative outcomes. The need to judge, to identify successful creations (new and useful), from unsuccessful or less novel ones motivates a series of decisions through which Amabile and those models which base their inquiry on her theory must subsequently navigate. The casualty of these decisions, particularly the decision to focus assessment on the creative product, is ultimately the creative process of technical implementation, which becomes black boxed and subsequently ignored. Unsurprisingly, when we arrive at models attempting to explain organizational creativity, we are presented with a series of antecedents or variables, which, research of this nature suggests, will result in a favourable or unfavourable environment or set of actions for creativity. What it will not do, is engage with the process of creating itself, potentially undermining the purpose of its use in organizational research.

How then, to overcome the current image of novelty in studies of organizational creativity? The first step is to take a closer look at what novelty actually means in this context. As Alexander Styhre (2006) notes, studies of organizational creativity are almost entirely predicated on a common-sense understanding of novelty as a distinction between the old and the new (Jeanes, 2006), or the original and its copy.

In a similar vein to Margret Boden's (1992) aforementioned H-creativity, theorists of organizational creativity choose to wait for an object or outcome to be finished and determined novel before they begin their analysis, allowing the field to determine novelty on their behalf, satisfying the criteria that creative production has been separated from non-creative production. In doing so, theories of organizational creativity avoid the difficulty in determining novelty, but they also avoid the opportunity of moving past this common sense understanding.

From a process perspective however, it becomes clear that there is nothing straightforward about novelty in organizations (Chia and King, 1998; Nayak, 2008; Hussenot and Missonier, 2016).) Styhre notes that organizations are either considered to be against novelty, persisting through a capacity to institutionalise practice into fixed routines (Farjoun, 2010), or alternatively, are too eager to insist on the benefits of endless novelty as a form of creative destruction, without stopping for critical reflection. These conflicting views of exactly what role the creative production of novelty holds for organizations leads Styhre to argue that "the organization creativity literature has not yet fully examined the texture of interrelated practices, actions, decisions and forms of exclusion that is constituting creativity and the production of novel ideas and commodities" (2006, p.146).

Styhre's own contribution, building on a process perspective, is to consider what he describes as the empiricist image of novelty, which, rather than relying on a definition of old against new, treats novelty as a constantly emerging presence. In Styhre's view, only a small fraction of production is therefore recognised as novel, and attributed to a creative individual. This however, is only a creativity described by the world of values (Amabile, 1996), whereas within the empiricist image, novelty is

"not the central component of creativity; instead, notions such as connectivity, associations, assemblages and multiplicities point at the combinatory nature of creativity. Creativity is an act making connections and constituting hybrids and is not primarily what is begetting the new" (p.148). Osborne (2003) also suggests that novelty should be broadened to include practices and configurations, and argues that we could go as far as to forget all about creativity as an irrelevant psychologism, preferring instead to discuss a process of invention and inventiveness.

Likewise, Rehn and Vachhani (2006) propose the idea of the *post-original* in order to explore the supposedly uninteresting, non-creative productions which follow in the wake of the original. Pointing to processes such as derivations, knock offs and remixes, they seek to highlight the constitutive effect the old may have in creating the new. In a similar manner, Latour and Lowe (2011) suggest that a quick distinction between the original and its subsequent facsimiles should be refused. Referring to Benjamin's (2008) essay on the work art in the age of mechanical reproduction, they begin from a broadly similar position, agreeing that "*reproduction…substitutes for its unique incidence a multiplicity of incidences*" (p.7, emphasis in original). Rather than viewing subsequent reproductions as inferior to the *aura* possessed by the original,[6] they argue instead that "the real phenomenon to be accounted for is not the punctual delineation of one version divorced for the rest of its copies, but the whole assemblage made up of one- or several- original(s) together with the retinue of its continually rewritten biography" (2011, p.4). Simply put, Latour and Lowe argue that copies may add new layers to the originality of the original, rather than detract from it, by displaying its abundance and maintaining its trajectory.

Latour and Lowe point to Charles Peguy, who argued that “if we stop interpreting, if we stop rehearsing, if we stop reproducing, the very existence of the original is at stake. It might stop having abundant copies and slowly disappear” (As cited in Latour and Lowe, 2011, p.6). This argument also finds support in other works which have questioned the value of originality and its relationship to repetition and reproduction. The problem is developed in Kierkegaard’s 1843 *repetition* (2009), understood as a dialectic “since the movement of "repetition" also makes it new, makes "the new"-simultaneously with being a repeating re-duplication” (Melberg, 1990, p.74). Similarly, Gabriel Tarde, building a social theory based on the creative potential of imitation, argued that ‘repetition exists . . . for the sake of variation’, and not vice versa (1903 p.7, as cited in Toews, 2003, p.89), both of which provided inspiration for Deleuze’s (2004) work. It is also notable that each of these approaches eschews the desire to judge (Deleuze, 1998). preferring instead to see different instantiations of novelty and originality (which, as Sennet notes is first and foremost “a marker of time” (2008, p.70), and thus creativity. Whilst somewhat of an anathema to the current organizational creativity literature, relaxing a commitment to the judgement of novelty may be both required to consider the creative process, and may in turn lead to a more creative approach to research in and of itself.

To return to the themes of this chapter, adopting a processual understanding of novelty allows the research to consider how techniques interact with mechanical processes to create new products and outcomes. Whilst the goal of mechanisation is to apply mechanical principles in order to render outcomes fixed and determinable, we may ask what happens when these are turned towards indeterminate ends (Rehn and Vachhani, 2006). By loosening the demand for determining novelty and

accepting it as something continuously emerging, warping "things out of every original rut" (James, 1910, as cited in Chia and King, 1998, p.461), it is possible to explore how techniques such as replication, imitation and reproduction can be utilised to create new things. In the Atlas studio, for example, Rachel had been working on a set of wooden boxes, which incorporated some novel designs and an interesting production process. Eager to learn more, I ask her to explain their purpose and how they came into being:

[*In the Atlas Studio, I am with Rachel, who has gathered some off-cuts of plywood which she intends to etch with a laser cutter. Before doing so, Rachel begins by showing me some of her previous creations using the off-cuts*]

> **Rachel:** *"this is a plywood box, a plywood frame box, that, I started with the idea, I actually wanted to use it to frame my little insects (a set of wooden laser cut insects built up into 3D by layers) and they fit quite nice obviously because it sits quite thick, the idea was I was quite interested actually in using a lot of this plywood because, especially when we were in (Previous Location) we would have a lot of off cuts for plywood, and you can see the size, obviously with the frame, means you can go quite small…"*
>
> **Rory:** *"yeah"*, I respond, *"you've got the lines yeah,"* referring to the outlines of wood commonly produced by the Computer-Numerical-Control (CNC) routers.
>
> **Rachel:** *"awkward shapes,"* Rachel continues, *"unfortunately we didn't have the resources to keep a lot of plywood, especially as you can't recycle it as you can with a lot of…you can't chop it down finely into sawdust because of the chemicals in it, you might be able to reform it but you can't burn it, unlike hardwoods which you can break down to use in fires, for the moment there's no good way or easy way of recycling it… anyway, long story short, you can't do too much with those awkward shapes, so what I did when I had a bit of*

time, before they were chucked out because we didn't have the space to store large bits of plywood, I would try and just chop them down, so you see these strips that you get, because they're awkward and you have to sort of trim round them, trim them down, so you might get sort of weird lengths of smaller width plywood, but they're a bit neater to work with…you can make a few different things with plywood, but I thought frames would be a good idea, to frame the stuff I was using, and also I like to repurpose…"

Rory: *"yeah absolutely*" I reply;

Rachel: *"so I made quite a few frames like this, either to house objects, or for this particular object, this particular frame is going to be a picture frame. And it's just a little bit different to normal frames, and I made it myself! So I just used some of the basic tools that we had, the table saw at a 45 degree angle and just experimented a bit with this one particular process which I find works alright for me."*

I ask Rachel how she chose the specific structure of the frame (fig.9), which she explains was a simple process of experimentation;

Rachel: *"I figured it out, with the materials I had and the tools that we had, there are various ways of making, and it's also just a sort of generic joints, and this was the easiest and the most realistic way that I could make it, you've got some other joints, like finger joints, dovetail joints, and you can use different tools for that, but this one, I literally cut it at a 45 degree angle, and its perpendicular and you have the angle to make that, so that the box and then you can change the height or the width or the depth or whatever. So that's how I did the box."*

Rory: *"And the design?"* I ask, examining the pattern on the side;

Rachel: *"So for the decoration on the side that I've etched on just to add a little extra detail, I kind just googled, this is a Chinese pattern, I was just thinking of different things."*

Rory: *"So what drew you to that specific design?"* I enquire;

Rachel: *"well with my knowledge of how the computers trace images and what I wanted to, what I knew I could achieve in the end, this particular image, you'll see it sort of, the original, it's not simple but it was a good contrast of dark and light, after a while you kind of know what works when you're looking for things and a lot of the patterns, if you just google Chinese patterns, you'll come up with a whole load of things."*

I comment on the appearance of the pattern (fig.10) and the convenience of the process, given the time and resource pressures in the studio, to which Rachel replies;

Rachel: *"it just makes things a little more easy, but I mean, before the internet and image searching, which has allowed me to do this quickly, you've got a larger variety, I could have also got it from a book, or if I saw this pattern on the side of a chair or something, I could take a picture of it, and go through various software to enhance it, or like, I suppose inspiration or designs can come from various places."*

Curious on how this process affects the normal design process, I ask Rachel,

Rory: *"do you think throughout the project, did you have an idea of what the finished project was going to look like?"*

Rachel: *"sort of,"* she replies

Rory: *"so you were going to go for a Chinese design and the type of cuts you were going to use?"* I ask;

Rachel: *"well I sort of had an idea in my head of how I'd build it,"* she responds*, "and that just evolved as I was building it, I was like I need this piece here (lifts piece) and cut that out of the wood, and doing it that way you can… this is actually from one of my other bugs before, I was going to make a similar one (Rachel refers to the intended recipient of the frame) but for other frames, it just depends, I sometimes think about what's going to go in it or who it's for, and adjust it, accordingly.*

Figure 9: Rachel's box frame, with Chinese pattern

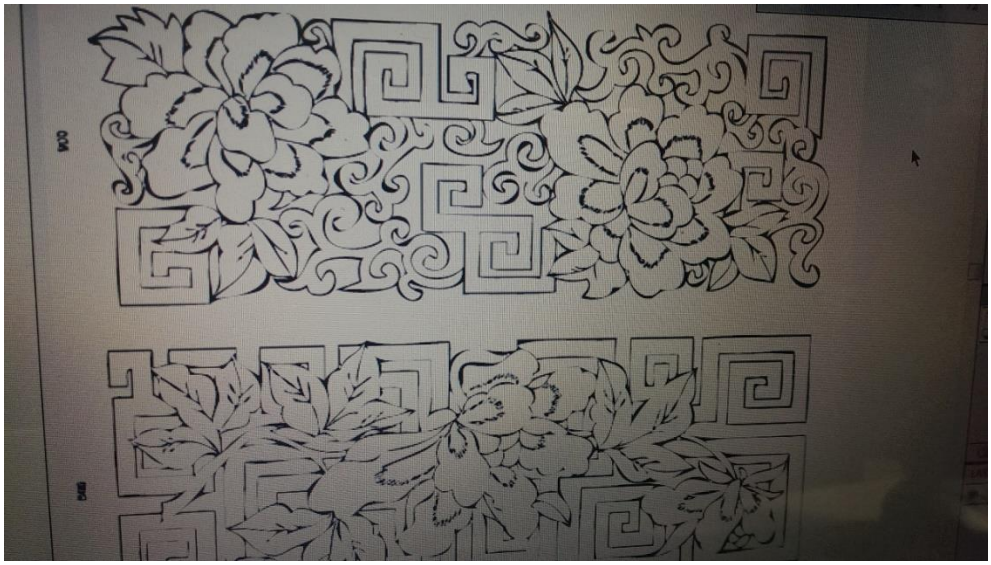

Figure 10: Close up of pattern on CAD software

I attempt to summarise the process, and establish what Rachel considers the difference between creating the box "from scratch" compared to gathering different elements from different places, to which she responds

> **Rachel:** *"well the thing is like, if I had this idea for like a Chinese pattern I have probably looked at previous patterns, even if I did draw it from scratch, it's also to an extent, I wouldn't necessarily trace it, maybe I'd have hand drawn it or taken from other inspiration and …"*
>
> **Rory:** *I suppose even if you were doing it from scratch you'd needed to have seen a Chinese pattern to know what one looks like,* I reply;
>
> **Rachel:** *yeah, you know, you have your ideas stem from somewhere, that's kind of like how you were trained as through learning art and art history, and architecture, you always look at precedence, present studies, and that's kind of… how most art originates from, and you can get original ideas, and you do, but your mind, a combination of things you've seen or heard or found beforehand, so it might come from the depths of your brain, something from when you were a kid or saw on the news yesterday, but it's kind of entered your consciousness somehow.. you draw it from somewhere, and it can be anything,*

Reflecting on her own creative process, Rachel makes important links, capturing how all ideas are both novel and simultaneously old. With respect to originality and unlike Benjamin's (2008) views, Rachel continues to affirm an alternative view of originality:

> **Rachel:** *I don't see any reason why something like art , I don't want to get too deep, but it can mean something, and I think it can either mean something to the artist or it can mean something completely different or the same thing (to another person) and they can use it, and I don't think there's something wrong with something being appreciated because someone likes it visually, it doesn't have to mean anything, particularly deep as such, but you can… it's like what you say about creativity, I don't know, it might not make sense but,*

> *not like the value of how you perceive something, like if you looked at something and said, "that's really original" or different or whatever, it's just maybe cause you don't know the comparisons to what has gone before, so what might be original to you, the person who's designed that or made that or created that, they'd have been influenced by something else, and they're not necessarily copying something, but they would definitely be affected by it, in how they do a particular object or style or process.*

As Rachel's example shows, aspects of mechanical reproduction have influenced the overall process, complicating the traditional image of the creator's idea as being solely responsible for the outcome (Ingold, 2009). The pattern in particular has been digitally copied and etched on the frame, seemingly in an imitative, uncreative manner. Yet if the matter is considered further, the picture becomes more complicated. Firstly, the idea for a pattern of that style was intentional, and as the designer rightly points out, had she done it by hand she still would have likely had some recourse to an example. Secondly, in an effort to describe her own idea generation process, Rachel clearly makes the point that ideas themselves can be reflections of previous experiences, images and feelings (a point also captured by Thompson's (2018) study of imagination). Thirdly, the particular pattern chosen was in consideration of the capability of the technology's ability, a technical choice made from the available properties (Latour, 1994a). Finally the particular configuration of machinery used to achieve the final result is a mix of CNC routers, a table saw, a computer, the internet, the design software, the laser cutter and Rachel's own know-how. Given such an array of inputs, why should it be so unthinkable to find novelty in imitation and reproduction in an assemblage such as this (Chia, 1999; Wood, 2002; Styhre, 2006)?

The issue is perhaps more with the delegation to machines and the antinomy between culture and technics (Simondon, 2017). As Ingold (2000) argues in his distinction between manufacture and machinofacture, if a machine entirely automates the process, the human is cut out and the ends will become determinate, as it cannot think for itself. The more engagement or control the worker has over the production process however, the more likely something new will arise, as human intellect is both directed and changeable (Bergson, 1911; Ingold, 1987). With regard to the assessment of novelty, to ignore the processes of imitation and reproduction as uncreative (or lesser than the original) is to ignore the potential for novelty to emerge within the intentional processes of engagement between human and machine. Such intentionality is already implicitly recognised in art and design, as Rachel Discusses;

> **Rachel:** *"people will purchase art, or an artist will create, a piece in order to be sold, so you've sold it as art, and with collectors nowadays pieces go for ridiculous amounts of money because they're collectable for whatever reasons. However design isn't necessarily seen that way, well at the time you'd get like an engineer who'd design, but only this cog to fit this screw so it's this size shape etc. and there's something in there- like how a scalpel, a surgical scalpel, is a good example of design performed intentionally, like it's designed because it has the purpose of being- to hold the blade, to balance, and you know you might call that beautiful or whatever, but again, that's a completely different"*
>
> *(pauses)*
>
> *"Like when you can see the skill involved with something, perhaps why I don't know, it's tough when you're talking about art, you get some people where you're talking about a certain amount of skill or craftsmanship into something"*

Anna, the business development manager interrupts;

Anna: *"sorry, are you dissing artists?"* (laughs)

Rachel: "*No*!" Rachel replies "*you can appreciate it, but at the same time, there's a thought behind it which you don't necessarily understand, where it's the problem with valuing things, it's like the case where a lot of work, like man-hours, physical man hours or something has gone into that, but then a lot of thought has gone into something as well; how do you…."*

Rory: *"how do you work with that?"* I suggest;

Rachel: *"how do you value that, it's essentially like, I'm not saying you have to put a price on everything but, by any means but… obviously like when you do sometimes you're paying for a name …*

Rachel attempts to summarise her views on the matter, connecting art, design and education;

Rachel: *that's why…it interesting like I say with art, and painting you can see it, so like say you weren't a very good painter you can kind of appreciate- "aww that must have been hard" because it looks really real or lifelike or whatever, whatever their perception of good is. And then with design, say you got a really well designed book or a pencil or a kettle or something like that, because you practically use it, you're not looking at it for its, like some things are designed for aesthetic value but some things are…like this craft knife…the feel, the weight, the practicalities of it, I take it and I use it, whereas someone else might use it and you don't think about the designer who's thought of all those things and what that sort of process is between a designer and an artist… the designer not only thinking of the form of it, but also thinks about the processes of it.*

Recalling the issue of black-boxing noted in chapter 2, Rachel expands on the hidden intentions to be found within the production of new things (Akrich, 1992). Building on this, Rachel then returns to the other designers who use the Atlas studio, and whether they can achieve new or creative outcomes:

> *so you see that a lot here, so like some people might have an idea, "I wanna do this!" and they kind of ask us our advice on how to do it, and we'll help them, and usually its best if they have an idea and we sort of advise them in the right way, what is a bit harder is "I want to make a chair, how should I do that?" then they're not a designer in the sense that yeah they've thought up an idea, but part of being a designer is knowing the processes – you don't have to know them all off by heart – but you have to know an idea of how it's made, so I want this to be in plastic, I have to know is it an injection mould or its it cast, is it going it be vacuum formed, however, but you've got to begin to have an idea and that's where the value in education, of knowing what you can do, to create something, whereas a lot of people, and this isn't a criticism of people because some people might just have an idea, and be like "right I want to do that" but there is still value in knowing how to do something.*

As Rachel's comments suggest, the question of novelty may be better attached to intentionality. Highlighting a distinction in perceptions of art and design, it is clear that the assessment of value is not always a reliable indicator, and even if it were, the nature of the values being assessed is unlikely to hold from one individual to the next. All of this comes together in support of the view that novelty as commonly understood presents its own problems, and may therefore benefit from critical analysis and development (Styhre, 2006).

Conclusion

In summary, this chapter has sought to critically reflect on the organizational treatment of creativity via the dimensions of technique outlined in chapter three. Having identified the problematic relations between creativity and technique, I have

suggested that a classical degradation of the craftsman's practical arts in favour of those activities emphasising thought and reflection has resulted in a reduction of both technology and technical activity, conflating it with mechanical implementation. This degradation has also led to a distinction applied to creative action in which creative ideas are placed anterior to their implementation via technical means. The resulting emphasis on thinking over doing has been partly responsible for the commonplace assumptions found within the organizational creativity literature, which assume creativity to be the generation of successful ideas and primarily the domain of the creative individual. Drawing upon process organization studies, I have sought to show the ways this disconnect has impacted the study of organizational creativity, developing three critiques of the organizational creativity literature and presenting workable alternatives via examples from the Atlas and Helios studios.

In the first critique, I have highlighted the absence of technical objects from studies of organizational creativity. This absence is unacceptable not only from the position of technique, but also in the issues it creates within the field itself. The problem that emerges is that within organizational creativity, objects are unexamined until the point at which they are designated as a creative outcome, at which point they become the focal point of investigation. Technical objects and materials are therefore not held to have an influence on the creative process, but are paradoxically treated as one of its clearest indictors. As a solution, I offer an analysis which re-engages techniques and technical objects through an examination of the different agencies found within the process of creating. Highlighting these agencies and the swapping of properties which occur (Latour, 1994a), the analysis shows how techniques and technical objects have clear roles in the creative generation of new forms.

Building on this initial critique, I have identified a further issue with the use of the creative product as an indicator of creativity. This problem arises from the desire to separate creative from non-creative products, which often results in a prioritisation of researching things that have already been deemed creative. This decision results in a backwards reading of creativity which begins with the finished, 'creative' product. In waiting for a product to be both finished and retrospectively deemed creative, organizational studies of creativity lose much of the impetus for describing how creativity emerges within production. Following the work of Tim Ingold, I have suggested that constructing theory in this manner results in a view of creativity which unwittingly entrenches the view that the creator is the sole author of creative products or outcomes. Challenging this view, I have examined the designer's experiences of designing and making to show that the idea can be considered as just one of many forces which inform the final product. If however, we do not begin with the finished product and attempt to read creativity forwards (Ingold and Hallam, 2007; Ingold, 2014), the idea appears as one amongst many forces which inform the final product.

Finally, I have identified the attribution of novelty as a key element which needs to be rethought if techniques and technical activity are to be incorporated within studies of organizational creativity. In waiting for products to be finished and deemed creative, studies of organizational creativity are often beholden to a social definition of novelty. This view of novelty however, is in many ways incommensurable with a forwards reading of creativity, which is focused less on determination than on the dynamics which cause new things to emerge. Taking inspiration from process studies utilising alternative visions of novelty, I have sought to show through a consideration

of issues such as reproduction and replication that within production, novelty is far from a clear cut distinction easily determined by observers or practitioners. Eschewing this reading of novelty and examining the creative role of aspects repetition and replication in the production process, I show through an examination of activities in the studios that novelty may be more productively thought of as a force which necessarily accompanies change.

In the next chapter, I turn to consider the resources to be found within the theory and practice of design, exploring different uses of the concept and the different design techniques (design thinking, prototyping and structured improvisation) found within the Atlas and Helios studios.

5. DESIGN

Introduction

As demonstrated in the previous chapter, the question of technique presents a problem for the dominant perspectives within the existing organizational creativity literature. In particular, I have sought to highlight how mainstream theories of organizational creativity are heir to an historical degradation of both technical objects and the attendant *tekhne* of production (Ingold, 2000; Sennett, 2008), which has resulted in an imbalanced view of the creative process with respect to technique. In response to the question of how technique contributes toward creative practice, I have utilised a process reading of technique and process studies of creativity to critique this literature and to point toward a means to move beyond it. Seen in this light, Creativity should not be treated as the imposition of a form conceived in advance by a knowing subject, but rather thought of in terms of how different agencies come together to generate new outputs (Chia, 1999; Styhre, 2006). Nevertheless, doing so naturally presents problems of its own. If this point of view is accepted, questions must then be raised as to how it should to be incorporated into everyday organizational practice, and the subsequent implications of this viewpoint for how people go about the business of critically making things (Ratto, 2011). The

resources required to answer these questions are, I believe, to be found within the theory and practice of *design*.

This chapter therefore begins with an examination of the concept of design itself. Defined as the "planning and patterning of any act toward a desired, foreseeable end" (Papanek, 1984, p.3), 'design' has taken on a variety of connotations within and beyond organization theory. Whilst the term is familiar, it is also potentially misused when applied only to superficial criteria, undermining both designed outputs and the actions of design thereafter. Recognising that in the English language design is both a noun and verb (Flusser, 1999), I consider the relation between the two and their implications within its meaning and usage.

I then develop three perspectives to situate the concept with regard to issues developed in the preceding chapters. I begin with an overview of the science of design, drawing primarily on Herbert Simon's (1996) *Sciences of the artificial* to outline the core tenets of his position and consider its influence on the field of organization studies. Assessing the limitations of Simon's work I turn to design perspectives drawing on process thinking, which has sought to avoid the rigidity of the computational perspective by drawing upon pragmatist philosophies of action and inquiry. Finally, I examine the particular entanglement of design and technique, paying attention to the different agencies, associations and artifice found within production. I suggest that design, which treats signs, things, actions and thoughts as resources to be composed or reformed (Buchanan, 1992), is the means through which the real effects of judgements of value are brought to bear upon the world of production (Thévenot, 1984; Boltanski, 2001). These three perspectives provide different insights into how different agencies have been dealt with by the design

literature, opening up an opportunity to consider a novel image of creativity through the techniques of design.

Following this, I explore three design techniques found within the Atlas and Helios studios, beginning with ‘design thinking’. As a term utilised within the studios, ‘design thinking’ referred to different ways of approaching the challenges presented to the designers within production. ‘Design thinking’ in practice is enacted as both a means of problem solving, and a question of style or of a preferred way of doing things (Kimbell, 2011). As I argue in this section, ‘design thinking’ is therefore less to do with an abstract contemplation of form and more to do with an engaged mode of thinking in the face of a design problem (Brown, 2009).

With this engagement in mind, I then move to consider the role of prototyping in design. In this section, I argue that intentions are negotiated and re-shaped through a confrontation with the technical means of their realisation (Carlsen, Clegg and Gjersvik, 2012). The process of prototyping, I argue, exposes the flaw in treating creative outputs as forms conceived in advance of their production. Rather, prototyping highlights the instability of ideas and intentions, a characteristic which also acts as a source of flexibility. Through the process of prototyping, ideas and intentions are brought to bear upon, and in contrast to, the properties afforded by the technical means of their realisation. As a result, both undergo a transformation, the outcome of which may generate further novel associations or technical forms.

Finally, I turn to the techniques of structured improvisation. Found in activities such as group meetings, discussions or brainstorming sessions, structured improvisation provides a space where competing ideas and intentions are made transferrable by

technical means. As a recurring form of action, these techniques aid the development and decision-making process for generating new ideas. The particular process of making ideas transferrable by technical means exposes the different temporal characteristics of communication and the different technical objects utilised in doing so (Jones, McLean and Quattrone, 2004). This process shows how both the technical and symbolic can act as either a stabilizing or destabilizing force within production. Taking an example of using post-its, I describe how this simple technique supports the processes of improvisation and idea generation. I conclude this chapter with a summary of the main themes discussed.

The Concept of Design

What is meant by the term design? In the previous chapter, I have been critical of an encroaching, mechanistic worldview which separated design, understood as the contemplation of form, from the process of construction (Ingold, 2000). Unsurprisingly, accounts of design as a preoccupation with ideas annexed from their implementation still feature prominently. Christopher Alexander's influential (1964) *notes on the synthesis of form*, for example, begins by asserting that "physical clarity cannot be achieved in a form until there is first some programmatic clarity in the designer's mind and actions" (p.15). Whereas (and as the previous chapter has shown) mainstream studies of organizational creativity have been content to deal almost exclusively with this dichotomous image of thinking and doing, studies of design are differentiated by a corresponding concern with the content or context of a design problem. As Alexander argued, even in the most architectonic views of

design, the task of solving the problem at hand retains a practical connection with the surrounding environment, problematizing the view of creativity as the development and unproblematic execution of ideas. Design is not simply concerned with "the form alone, but the ensemble comprising the form and its context. Good fit is a desired property of this ensemble which relates to some particular division of the ensemble into form and context" (p.16).

This concern with 'good fit' is also found within studies of organization, which have treated the design of new organizational forms in response to environmental challenges as a key area of inquiry (Bittner, 1965; Starbuck and Nystrom, 1981; Astley and Van de Ven, 1983; Romme, 2003; Dunbar and Starbuck, 2006; Sarasvathy, Dew, Read and Wiltbank, 2008). In such studies, it is often the perceived challenge or new occurrence in the environment which drives the development of new forms, such as the proposition of semi-structures in the face of an accelerating environment (Brown and Eisenhardt, 1997) or the development of modular designs in response to the need for greater organizational flexibility (Sanchez and Mahoney, 1996). For Gibson Burrell (2013), this organizational interest in reshaping existing organizational structures emerges from an underlying 'will to form', also found within architecture and the development politico-economic systems. The 'will to form' reflects the implicit desire to both create and stabilize everyday experience in the face of environmental challenges. Terms such as 'organization', 'design', 'system' and 'architecture' are in fact so closely related that they are often used synonymously, or in hybridized expressions such as 'organizational design' and 'system architecture'. What perhaps best separates the 'will to form' from creativity however, is the emphasis on planning and environmental engagement rather than a

preoccupation with abstract idea generation. From the perspective of design, the task at hand is conceived as the "planning and patterning of any act toward a desired, foreseeable end" (Papanek, 1984, p.3) or as an "inquiry into systems that do not yet exist" (Romme, 2003, p.558; See also Simon 1996). Although these actions may yield creative results, they are primarily concerned with set of tools to help the designer grapple with the challenges of a given task.

Whilst the notion of designing new systems is prevalent within organization theory, the idea that organizational agents are themselves designers, or that organizational activities utilise the techniques of design, is less common. As Vilem Flusser noted, design can be treated as a noun, concerned with plans, goals, intentions and structure, or it can be considered as a verb, meaning "'to concoct something', 'to simulate', 'to draft'…'to fashion', 'to have designs on something'" (1999, p.17). This blurring of the boundaries between thinking and doing stands in stark contrast to the clear separation found within the organizational creativity literature, which I have critiqued in the previous chapter. In contrast, theories of design do not typically recognise such rigid distinctions. In *The Sciences of the Artificial* (1996) for example, Herbert Simon argued that rather than being limited to the abstractions of scientists, theorists or engineers, design could be undertaken by anyone "who devises courses of action aimed at changing existing situations into preferred ones" (p.111). For Simon, there was no fundamental difference between designing a theory, a material good, a treatment plan for a hospital patient, or an administrative task within an organization. As I shall argue throughout this chapter, whether design is considered a science, a form of inquiry or in relation to technique, design is lessened

when viewed as separate from its execution, or when viewed as simply the abstract contemplation of form.

A consequence of this disconnect between thinking and doing leads to the view that design only attends to the superficial aspects of objects. Latour (2008) notes that design has commonly (and incorrectly) been understood as *re-looking*, as "a way to redress the efficient but somewhat boring emphasis of engineers and commercial staff…by adding a veneer of form to their creations, some superficial feature that could make a difference in taste and fashion" (p.1). When referred to in this manner and applied to everyday items, the concept of design can appear more closely aligned to ornamentation than to technique or the serious application of technical principles.

A similar point is made by Herbert Simon, who also addressed the view that the methods of design can be treated as "intellectually soft, intuitive, informal and cook-booky" (1996, p.112), in comparison to the natural sciences. However, whereas Simon attempts to rectify this misconception of design by establishing a determinable set of elements, Latour travels in the opposite direction, highlighting how the term has grown to cover an ever increasing number of activities "applicable to ever larger assemblages of production" (2008, p.2). For Latour, this enlargement of the concept challenges the modernist division between progress, detachment and a mastery over nature on the one hand, against the care, dependence and entanglement with the world on the other. To see ourselves as designers, rather than modernisers, Latour suggests, represents a rejection of the central tenets of modernism, and with it, some of the key assumptions on the nature of thinking and doing.

In what follows, I wish to argue that design does represent a different means of engaging with the environment: one reliant upon technique, and one that is markedly different from the assumptions of the creative individual critiqued in the previous chapter. Before doing so, I shall present three areas of its study which are relevant to understanding this direction. Firstly, I examine Herbert Simon's approach to design to provide an understanding of early attempts to formalise it into a method comparable to those found in the natural sciences. Recognising the limitations of this approach, I shall then examine a second development between subsequent theories of design and process philosophies of action and inquiry. Finally, I examine design and technique, paying particular attention to the entanglement of signs, things, actions and thoughts (Buchannan, 1992).

The Science of Design

Whilst there may be a commonality found in the adoption of broad definitions of design, there has been less agreement on the aims and methods of its study (Bayazit, 2004; Cross, 2007). For Herbert Simon, an early proponent of the concept, design was to be a science of the artificial (as opposed to a natural science, which typically excluded any normative judgements), chiefly concerned with mediating between the internal world of information processing systems and the external environment. Within this framework, Simon argued that a prospective theory, practice and pedagogy of design, largely inspired by computational systems developing in the post-war period, should incorporate the following three features: 1) a formal logic of design and the process of evaluation 2) an approach for searching for alternatives 3) a theory of structure and design organization, and 4) a theory of the representation of

design problems. In order to further understand Simon's ambitions for the study of design, and highlight areas of criticism, I shall explore these areas further.

Simon's approach to design begins by establishing the logical basis for design decisions. Highlighting that the standard logics employed within the natural sciences deal with how things *are*, he instead drew attention to the idea that an artificial science (such as design) must primarily concern itself with how things *ought* to be. This distinction presented a challenge for developing any proposed logic of design; a challenge, which Simon suggested could be overcome by introducing additional inferences to those commonly found in the natural sciences, or modifying existing logical rules to accommodate for statements containing "should", "shalt" or "ought". It is worth noting that Simon was aware that design problems can often be reasoned "loosely, vaguely and intuitively" (p.115-6): nonetheless, he chose to focus his attention towards areas where aspects of formal rigor can be observed. Inspired by computational methods found within design engineering, Simon offers the example of 'optimization' as a form of design based logic, in which:

> "The "inner environment" of the design problem is represented by a set of given alternatives of action…The "outer environment" is represented by a set of parameters, which may be known with certainty or only in terms of a probability distribution. The goals for adaptation of inner to outer environment are defined by a utility function- a function, usually scalar, of the command variables and environmental parameters perhaps supplemented by a number of constraints (inequalities, say, between functions of the command variables and environmental parameters). The optimization problem is to find an admissible set of values of the command variables, compatible with the constraints, that maximize the utility function for the given values of the environmental parameters." (p.116)

In a given task, if one can define the means (command variables), the laws governing its operation (fixed environmental parameters and constraints) and the goal to be achieved (utility function), then a search for the optimal route can be undertaken. One example offered is that of a game of chess, in which optimal strategies could be designed for a variety of different aims, such as to minimise risk, as well as in-game procedures for "finding good moves in actual board positions in real time" (p.119). It is recognised however, that attaining the optimal outcome is not always achievable in the real world scenarios faced by designers. Often, it is less a case of 'optimal' and more a case of better or worse, and regularly necessary to achieve a 'satisfactory' result than a perfect one. Simon's term 'satisficing' aims to address this, acknowledging that in real world scenarios a "formal but impracticable algorithm" (p.121) which would attempt to account for all possibilities is less useful than one which will in practical terms yield a satisfactory result.

The desire to arrive at the most satisfactory option leads naturally to "the logic of the search" (p.121), or the process of finding and evaluating alternative sequences of action. When attempting to reach a desired outcome, a number of different alternatives may present themselves, such as different routes through a maze. What logical processes allow us to design a means of navigation in such a scenario? Simon argues that any goal seeking system requires the connection of two channels, an *afferent* channel, which is capable of receiving information, and an *efferent* channel, which is capable of acting upon the environment. The success of any goal seeking system depends on the relations between these two channels, "on building up associations…between particular changes in states of the world and particular actions that will (reliably or not) bring those changes about" (p.122). The challenge within

the search then, is to establish such associations and determine the roles of the component parts (e.g. action A may be resolve difference D) and establish different types of strategies for dealing with different classes of problems faced, such as a dead-end in the maze mentioned earlier.

In the real world of design problems however, the process of taking action can often "have side consequences (may create new differences) and sometimes can only be taken when certain side conditions are satisfied" (p.124). Due to this, designers can never be certain that a specific set of actions or design which solves one problem can be considered applicable to all problems of that type. As a result, Simon suggests that in practice designers do not often follow one path or strategy to its inevitable success or failure, but rather "begin to explore several tentative paths, continuing to pursue a few that look most promising at a given moment" (p.124). Simon considers common strategies for determining how such alternatives should be managed, outlining resource allocation as a particular example. Within the concept of resource allocation Simon finds two strategies which explain how it may govern the search for alternatives. In a given task one could, for example, seek to conserve resources in order to achieve a satisfactory design outcome if the raw materials are scarce, or where scarcity is not an issue, seek to manage the design process itself to avoid unnecessary expenses on potential routes which are unlikely to produce value.

Key to both strategies is not the recourse to an economic analysis, but the attribution of value to different potential routes during the search process. Such values are, as Simon notes, not directly attributable to real world outcomes (in which only the successful path could be designated a value of 1, and all others 0), but do have their use in assisting the next step forward or choice of direction in the design process.

Simon returns to the example of chess, stating that the first move taken on a board opens up a range of possibilities which could not be generated from the list of possible opening moves. As such, a broader concern within Simon's framework for design is not just arriving at the desired outcome, but also understanding the nature of gathering information from the environment and its different uses within the course of such design based actions.

Having proposed how design activities can proceed logically and identifying the conditions of the search, Simon continues to consider the principles guiding the organization of these two processes. This begins with an identification two organizational forms as an example: a hierarchy of levels and a boxes-within-boxes approach. Within a system it is understood that if component parts can be established and identified, a better understanding of how that system works can be achieved. When designing such systems, it can therefore be useful to consider both the unity of the system as a whole, as decomposed into requisite parts, raising the question of the best way for arranging such parts. Understanding systems either from the viewpoint of hierarchical levels (such as ordering by the size of relevant components) or by patterns (such as the recurrent boxes-within-boxes recurring at different levels) can assist in the design and operation of such systems. Such classifications are not exclusive, as complex systems such as organizations, as Simon notes "can be divided up by subfunctions, by subprocesses, by subareas, and in other ways" (p.128). Ordering the design process may also assist in the search and development of alternatives described earlier. An awareness of the sequencing of operations or programs within a system may also yield different means of organizing the design process, such as designing from the bottom up or the top down, inside-out or outside-

in. Such logics may therefore apply to anything from designing a house to designing a computer program.

The final aspect proposed by Simon is the issue of how designs should be represented. This particular area is underdeveloped, however does include the critical insight from Simon that a key feature of solving a problem through the process of design involves "representing it so as to make the solution transparent" (p.132). Even where this is not possible (Simon does not go so far as to suggest a universal theory of successful representation could be developed), he does note that an understanding of the relationship between the representation of the problem and the means by which it is solved marks a significant area for future research. Simon's own contribution is to suggest a taxonomy of representations and their relations to the design. Designs and design problems can be represented verbally through language, mathematically through theorems, spatially through 3-D models or renderings, or diagrammatically through flow charts or programs when describing action or movement.

Simon's science of the artificial, despite its ambitions, did not usher in the sort of objective, rational basis for problem solving and decision making approach to design described above. Though the work remains important, particularly within organization science (Sarasvathy, 2013), the computational perspective underpinning it, and the desire to represent problems mathematically, were challenged, particularly with regard to their usefulness in social aspects of design issues (Huppatz, 2015). In response to these limitations, a second wave of design approaches emerged, inspired by the philosophies emphasizing action and inquiry.

Perspectives which build upon Simon's theories and also recognise its limitations can be found in the work of scholars more concerned with the role of interpretation in the design process (Boland and Day, 1989, Buchanan, 1992; Schön, 1991; Garud, Jain and Tuertscher, 2008). Within these works exists a rejection of the rational designer as 'decision maker' (as presented by Simon) in favour of a designer as an interpreter: one fundamentally concerned with the meaning of structures developed by themselves and others. Such theories have been noted to draw (amongst other traditions) on process perspectives,[1] such as the American pragmatist tradition (Carlile, 2002; Romme, 2003; Coyne. 2005; Kolko, 2010; Whitford and Zirpoli, 2014) Hermenutics (Boland and Day, 1989; Boland, Tenkasi and Te'eni, 1994) and theories of drawing upon STS (Suchman, 2000;Woodhouse and Patton, 2004). Typically, such studies are more concerned with the nature of *praxis* – that is – the process of production and the effect those products have on human activity, with the hope of developing a more reflective approach to existence (Bernstein, 1971) than establishing steadfast laws or rules of design.

The question asked, in contrast to Simon, is often not whether the outcome has been achieved efficiently, but has it been done *well*. Boland and Day (1989), for example, developed a hermeneutic perspective, in which primary focus was granted to the subjective *experience* of designing a system, the "personal process of giving meaning to the world through language and action" (p.102). The hermeneutic process, born from a tradition of textual interpretation can be considered universal to all aspects of life. The problems of design therefore become hermeneutic problems of meaning,

interpretation, and significance to ourselves and others (Boland and Day, 1989). Through a study of the design and implementation of a new knowledge based system, the authors identified three particular areas of exploration, namely the role of space and boundaries within the organization, the challenge of interacting with others and the moral choices faced by the designer. A notable difference between this work and that of Simon's was a redefinition of what could be considered as rigorous, with the authors affirming it was the process and production of meaning, rather than the success of the outcome, which could then contribute towards subsequent interpretations.

This interpretative design approach was further developed by Boland, Tenkasi and Te'eni, (1994) who took their lead from the hermeneutic perspective in order to consider both the ways in which cognition is distributed within the organization and the subsequent implications for design. Recognising that for many, organizational life involved regular interactions with technology that displaced and transported action (Orlikowski, 1992; Cooren, 2006), the authors argued that cognition should be seen as distributed amongst the organization. Reflecting this, the question was then raised as to exactly how technology supported the distributed design activities of the employees. For Boland and colleagues, much of the existing technological architecture assumed the user to be the rational decision maker envisaged by Simon (1996; 1991). Rejecting this conclusion, Boland and colleagues proposed a different system capable of supporting the distributed cognition required for design activities, allowing designers to "represent their interpretations, to reflect upon them, to engage in dialogue about them and to inform action with them" (1994, p.459).

Upon reviewing the differing philosophical approaches to the design of systems for inquiry, six design principles for developing a physical system were offered. The authors began with the first principle of ownership, arguing that the interpretation of a given situation is always owned by the interpreter, and should be recognised as such in order to interact successfully with others. To assist this process, the second principle of easy travel was introduced, which aimed to consider the quality of the system in supporting different interpretations. Thirdly, a system for supporting distributed cognition was required to account for the multiplicity of different perspectives of different agents involved in the process, as "the possibility of a hermeneutic fusion of horizons presupposes each actor has her own understanding and horizon" (p.467).

Any system capable of supporting the multiplicity of different interpretations necessarily entails the fourth principle of indeterminacy, which argues against the setting of fixed boundaries. Rather, in recognising different perspectives, systems should also recognise the likelihood that results may not always be precise or even well defined. The fifth principle of emergence aimed to direct the system towards potential outcomes which may emerge from the differing interpretations coming into contact with each other. Finally the system should support the final design principle of accommodating mixed forms. As the authors note, not all actors may represent their interpretations in the same way, and the system must be able to account for this.

Comparing these six principles to Simon's outline for the study of design, it is clear many similarities exist, however at the centre of each lies a radically different view of who the designer is and what the essential nature of their tasks demand. As for other design authors (Garud, Kumaraswamy, and Sambamurthy, 2006), instead of a

rational actor faithfully following delivering a programme, organizational design actions can be better characterised by emergence (Tsoukas and Chia, 2002). This pragmatic perspective is further developed by Garud, Jain and Tuertscher (2008), who argue that: "within such an approach, boundaries between designers and users become blurred, heterogeneous user preferences emerge in use, tasks remain partially partitioned and the goals of the design emerge through interaction" (p.367). The alternative metaphor offered by the authors is one of incompleteness as a feature to be found in systems capable of responding to a changing world.

One final counterpoint to Herbert Simon's initial agenda can be found in the work of Donald Schön (1987, 1991). For Schön (1991), Simon's science of design could "be applied only to well-formed problems extracted from situations of practice" (p.47), and was therefore an unsuitable candidate for exploring how the concept is enacted in action. In keeping with the aforementioned works above, Schön took aim at what he described as a "[t]echnical rationality…the Positivist epistemology of practice" (p.31) which had come to dominate professional knowledge. In contrast to this, Schön also turned to the resources of phenomenological inquiry to develop a view of design as reflection-in-action. Schön, like the process theorists noted in the previous chapter, considered design as "a conversation with the materials of the situation" (p.78; Ingold, 2009; Bennett, 2010), which he set out in the following description:

> A designer makes things. Sometimes he makes the final product; more often, he makes a representation- a plan, program or image- of an artefact to be constructed by others. He works in particular situations, uses particular materials, and deploys a distinctive medium and language…Because of this complexity, the designer's moves tend, happily or unhappily, to produce consequences other than those intended….In a good process of design, this

> conversation with the situation is reflective. In answer to the situation's back-talk, the designer reflects-in-action on the construction of the problem, the strategies of action, or the model of the phenomena, which have been implicit in his moves (p.78-9).

In comparison with Simon's science of the artificial, similar areas of inquiry may be observed, with both sharing concerns surrounding the issues of problem formation, search and representation. The difference in this instance however, centres on the distinction between reflection-in-action and technical rationality. As Schön argues, the underlying positivist epistemology of technical rationality demands a procedure in which effectiveness is measured against criteria set in advance. As Schön's above description of reflection-in-action shows however, such criteria are secondary to the indeterminacy of action and the agencies of production.

Design and the Dimensions of Technique

Building on these process perspectives, we may then turn to consider design and its relation to technique. As mentioned at the beginning of the chapter, the explicit theorization of design does not often receive a great deal of attention. There are however, areas such the study of organizational information systems (Suchman, 2007, 2005; Orlikowski and Barley, 2001), which, drawing on theories of STS and sociomateriality, share a both an interest in design and the techniques which inform design practice.

In a series of works spanning two decades, Wanda Orlikowski has sought to avoid both the technical rationality of Simon's work and an over-reliance on the social dimension of interpretation (Orlikowski, 1992; 2008). Having taken resources from

structuration theory (1992) practice theory (2008) and more recently the agential realism of Karen Barad (2007; Orlikowski and Scott, 2015), Orlikowski's work rejects clear cut distinctions between humans and technical objects in the process of design. Rather, and as I have noted in chapter three in respect of technique, Orlikowski seeks to shift dialogue from either perspective towards one which focuses on their mutual entanglement. The point is well articulated in her (2007) practice perspective on technology:

> When people use a technology, they draw on the properties comprising the technological artifact— those provided by its nature as a physical/conceptual object, those inscribed by the designers, and those added on by users through previous interactions...People also draw on their skills, power, knowledge, assumptions, and expectations about the technology and its use, influenced typically by training, communication, and previous experiences (p.267).

In Orlikowski's conception, the study of information systems has tended to swing, pendulum like, between modes of analysis which privilege technologies, to those which privilege the social. It has also notably begun to incorporate "middle-ground approaches…reflected in socio-technical and emergent perspectives" (2005, p.183). Likewise, a consideration technique also aims to consider how these different agencies come together. What then, is required? Or, how does technique contribute toward an understanding of design?

Considering the dimensions of technique, is will be possible to examine design and incorporate the role of ideas into practice without the aforementioned pendulum swinging too far towards the image of the creative individual, or toward the social image of technical objects as the mere receptacle of ideas.[1] Such an approach also aims to avoid the technical rationality of scientific approaches to design as well as

the anthropocentrism of design as an individual's action or process of interpretation. To achieve all of this, it is crucial once again to return to the resources of technique: the awareness of agencies, their associations, and the Daedalian paths in which they are drawn together in the service of different goals (Latour, 1994a).

I have shown in the previous two chapters that technical objects deserve their consideration in the processes of production, and the task when considering design, is to consider how the technical features of the organizational environment are entangled with the designer's world of signs, things, actions and thoughts (Buchanan, 1992). I have noted previously that design is commonly considered as the process of planning a series of actions toward some form of goal or fixed target (Papanek, 1984; Simon 1996; Romme, 2003), however, from the perspective of technique, this represents an incomplete picture. Undoubtedly, to design is to proceed with an idea or intention, but it is important to recognise that this process is never independent from the forces of other agencies (Cooren, 2006) intensities (Hjorth, 2013) and assemblages (Deleuze and Guattari, 2004; Latour, 2005b) found in the practice of design activities.

This point is well made by Madeline Akrich in her (1992) essay on the process of inscription. Part of the designer's role is to inscribe a certain set of values, norms or intentions into their desired output. A piece of software, for example, has been designed with a user in mind, and the designer will have an image of how that user should react or respond to that software (Suchman, 2007). Likewise, a graphic designer will have their audience in mind when producing images. As Akrich argues, the process of scientific design and innovation is "an attempt to predetermine the settings that users are asked to imagine for a particular piece of technology" (1992,

p.208). However, users are not bound by this predetermination, and so technical objects thus "remain a chimera, for it is in the confrontation between technical objects and their users that the latter are rendered real or unreal" (1992, p.208). Design is therefore a continuous back and forth between the designer and user, mediated by technical objects. It is through this "incessant variation that we obtain access to the crucial relationships: the users reactions that give body to the designer's project, and the way in which the user's real environment is in part specified by the introduction of a new piece of equipment" (Akrich, 1992, p.209). Seen from the perspective of technique, design therefore aims to account for ideas and intentions, through their deployment in the technical environment. This position complicates both the image of the individual creator and that of technical rationality, opening up a world of mediated experiences populated by different agencies, drawn together in the service of action.

Thinking of signs, things, actions and thoughts from the perspective of the techniques which maintain them is by no means a common approach and deserves further examination. Specifically, it will be beneficial to consider techniques beyond those instantly recognisable from tool use, and on this matter it will be instructive to consider the work of Luc Boltanksi and Laurent Thévenot. In their work on better understanding the practices of everyday life and the different regimes which govern these practices, these authors have developed a means of describing such relations. For Boltanksi and Thévenot, who originally set out to explore the connection between individual mental images and group representations (Boltanski and Thévenot, 1983), the ability of agents to move from a particular situation to a more general one, was due to a collective investment in formal means of action. In a move

reminiscent of Mauss' description of technique as "effective and traditional" (1973, p.75) action, the encoding of various roles within social settings, organizations or production processes (such as the establishment of rules, definitions or other nomenclature), allowed the formation of groups from individuals engaged in tasks to the formations of the state. (Thévenot, 1984).

For Thévenot in particular, these operations were only possible through technique, technical objects and their transformations in the environment: relations and transformations which help agents determine and develop the means of evaluating different regimes. As we saw in chapter three with the Helios designers, the norms and values of social life (such as those found within the worlds of industry, the arts, the home, or civic duty) are constructed and maintained through a technical assemblage of codes, protocols, or habits, assisted by the durability of the objects that support these activities (Thévenot, 1984; see also Boltankski and Thévenot, 1999).

This research was later developed into what Thévenot termed 'pragmatic regimes of enquiry' (2001) with a particular emphasis on an 'equipped humanity' (2001; 2002); a concept which utilized technical objects to create and strengthen different ways of living. The aim of approaching ideas and intentions alongside a consideration of technical relations is not to belittle the individual's action or desire for change, but to instead recognise that such agency can only be achieved by engaging with the material world. The role of opinions, styles, shared preferences, and the need to convince others –so important to the process of design– are productively framed by Thévenot as forms of mediated actions, enacted with respect not only to their

different forms of social engagement, but also with an awareness of how those forms are created and sustained.

The Techniques of Design

The previous discussion has elaborated how a consideration of design allows us to consider the ways in which different agencies and technical associations are pragmatically negotiated. To explore these ideas further, I will now examine three techniques of design: each highlighting both the relevance of the theory of technique and the potential value of design for process organization studies, beginning with design thinking. Far from being an individual act of contemplation, or a consideration of form prior to its implementation, I argue that design thinking is rather something necessarily connected to the technical environment in which the aforementioned social codes operate. Following this, I then move on to consider the process of prototyping. Further to the points raised in the issue of design thinking, I show that during prototyping, intentions are negotiated and re-shaped through a confrontation with the technical means of their realisation. The process, I suggest, exposes the flaw in treating creative outputs as forms conceived in advance of their production. Rather, prototyping highlights the instability of ideas and intentions, and how they are transformed in the process of their realisation. Finally, I examine the techniques of structured improvisation. The particular process of making ideas transferrable by technical means exposes the different temporal characteristics of communication and the different technical objects utilised in doing so. This process shows how both the technical objects and social codes act as stabilizing and destabilizing forces within production.

Design Thinking

The term design thinking has gained prominence, both in practice and academic discourse, despite reservations surrounding its longevity and exact meaning (Kimbell, 2011, 2012; Johansson-Sköldberg, Woodilla and Çetinkaya, 2013), and concerns that it has struggled to retain some of its original radical edge (Nussbuam, 2011; Coyne, 2005). Placing such concerns to one side, design thinking, in a similar manner to the approaches of Schön and Boland presented above, attempts to describe how design activities are undertaken, either in terms of micro-processes or styles of approaching design problems. As such, by following the approach of Boltanksi and Thévenot, we may then inquire into the shared codes, habits, and technical activities which inform this technique.

In the Atlas and Helios studios, the term 'design thinking' was itself greeted with a mixture of apprehension and dislike, –particularly in terms of its apparent popularity. After having voiced what they felt were problematic aspects of the concept and its utilisation, several designers did, however, go on to explain what it meant within their own design practice, providing a rather different outlook. One designer opposed to the concept was James, who disliked the idea of design thinking as a cognitive style or as anything removed from the process of design itself:

> **James:** *…I usually feel a slight tightening of the gut muscles when I hear somebody start to talk about design thinking,*
>
> **Rory:** *why is that?*

James: *well the perfect example would be a (Consultancy Company), who think of lots of things that you could possibly do, with the designs that ultimately need to be produced. And they think of lots of ways of framing that, talking to the client about it, yet ultimately nobody's actually designed anything! And at some point, they need to get some designers, and go, ah, I can design this now, and all that's really happened is that they've spent months and months talking about it, the clients spent fucking hundreds of money, and there's not really enough left to do the job properly at the end of it, and that's not an exclusive scenario… I mean it doesn't always work out like that, but my experience…*

Rory: *yeah*

James: *they have a role in certain engagements but the actual…design thinking needs to be done by people doing the design and that's what thinking about design should be. Design talking you could call it,*

Rory: *yeah I know exactly what you mean*

James: *and in fact I don't have a problem with that, if somebody's perfectly happy to sit and listen to it so be it. But not design thinking.*

The dislike of the concept stems from what James perceives to be a distancing from the actual practice of designing. James's comments echo Kimbell's (2011, 2012) concerns on the efficacy of the concept when removed from its everyday practice. James's barbed comments on 'design talking' refer less to the specific medium (discussion played a key role in the Helios studio, after all), and are instead directed toward the removal of responsibility for the implementation of a solution to a design problem. Such a removal, James believes, is essentially wasteful, as design thinking can only truly 'equip' the designer when there is a direct technical connection to the issue at hand (Thévenot. 2001). When I questioned James using different language such as design process or the development of a style within the studio, he offered a

very different perspective: one which highlighted that something akin to design thinking was of central importance:

> **James:** (referring to the idea of designers in Helios having a style or approach to designing) *I think what they maybe mean is they have an approach to problem solving, and what you can often find is that you...I would describe it as a toolbox, and the longer you go, and probably the smarter you are, the more tools you've got, and the more refined those tools become, so the more effective the more flexible your choice of which to use becomes easier, you remember about the ones you'd seen lying in a cupboard somewhere, years back, but you know you don't get that now, so that kind of… it's like an internal language of problem solving, and people problem solve differently and in the physical way they express that problem solving process is maybe what I'd determine as a style, it could be the way you doodle or take notes or go to a set of shapes or where you'd start from…*

James touches upon a number of areas, highlighting key areas of design practice described by the authors above in their attempts to articulate a theory of design. What he has described as the "*internal language of problem solving,"* and *"the physical way they express that problem solving process"* is notably similar to Schön's (1991) aforementioned notion of design as a conversation with the materials available. James continues to discuss the handling of the resources designers utilize when engaging in this process of design thinking, turning to describe 'organic processes', 'ingredients' and the materiality of the work itself:

> **James:** *people quite often start with something they know it's not right, and then sort of you know break it down or find some sort of, turn it inside out and try and get it to the thing it needs to be, so it's like building blocks I almost think, from some very simple components you can make something very convoluted or very rich, you know, it should still be something. I think that's maybe what folk mean, and in that sense because you can apply that*

process in response to different criteria, different stimulus, that it's also new, because the outcomes, by virtually the fact that you can't give the same solution to everybody,…well you can if you're one or two consultancies that we shan't mention, you soon get rumbled, and you lose all your clients! So you just have to make, things have to be different, no matter what anybody says, outcomes will all have to be different, because otherwise you haven't got a portfolio, so it's taking those.. I just think it's just something about the organic process, that you start with all the identical ingredients, put them through the thing, and they come out as two completely different things, there's something in that. The chaotic nature of matter is reflected in that (laughs).

This idea of problem solving, both the conceptual and physical sense, was recognised by many of the designers in the Atlas and Helios studios. Sarah, for example, after voicing her own scepticism on the validity and use of the design thinking described her process as follows:

Rory: *what do you understand by the term design thinking? Is it something you see a lot of?*

Sarah: *yeah, I think it's one of those buzzwords that is not that valuable to use because it doesn't mean that much to many people… but to me it means the whole creative process, so approaching a problem and coming up with…well first of all it means researching the problem, is it a real problem, who are the people that the problem effects, who are the users, yeah, is it actually a problem that needs to be solved or is it something that you think you can make money out of, and you probably can't make money out of it unless it's a real problem, with real people behind it.*

Echoing some of the concerns noted by James, Sarah notes the issue of correctly identifying the 'real' problem. Once such a problem has been identified, design thinking can begin:

> *…it involves coming up with more than one idea to solve that problem. Like when we were at uni it used to be 100 ideas, that might be excessive but I definitely think it means coming up with a whole range of ideas, and I think it's testing and analysing and reiterating those ideas in a cycle until you've got the one that's right, and then refining it. And I think that's design thinking, and I also think just approaching things from a different angle, so we used to get taught things like, so someone comes and asks you to design a new mobile phone for the Indian market, well, just take a total step back from that and go to India and research the people – is it a phone that they need, or is it that they're trying to do something else with phones, like it might be a completely different product that they need entirely and its just kind of looking at thing from a totally different angle, like it might be a new payment system that they need and is a phone the best way of doing that? Do they all have internet access? Is it actually a new internet device that they need or something?*

Despite their initial scepticism Sarah and James both raise a variety of themes common in descriptions of design thinking, such as idea generation, ethics of design, value, and as has already been highlighted, problem solving. These different aspects have been highlighted by the organizational design literature. Johansson- Sköldberg, Woodilla and Çetinkaya (2013) for example, have identified five different descriptions of the concept, including design thinking as; the creation of objects, a reflexive practice, a problem solving activity, a way of reasoning or making sense of things, or as the creation of new meanings. It is the aspect of problem solving however which resonated most with designers in the Atlas and Helios studios.

As I have highlighted earlier, the notion of a problem represents a key area of inquiry both for the theory and practice of design, particularly with regard to how they are to be treated. For Simon (19691996), a well-defined problem could lead to a series of

rational steps toward resolution. However, as Rittel and Weber (1973) argued, design problems were often ill-structured, indeterminate, *wicked* problems which required a different approach. Coyne (2005), drawing on Deleuze and Guattari, further argues that the appropriate response to wicked problems may be to accept that "there is no meaning greater than the parts" (p.11) and to attend to the different associations being formed within the technical assemblages that form the design problem. Evidence of this problem focused approach was found in the accounts of the designer's activities, such as in Frank's description of his everyday practice:

> **Rory:** *So How would you define your role as a designer?*
>
> **Frank:** *my role as a designer in Helios?*
>
> **Rory:** *yes so I would ideally like your role as a designer in general and then specifically in Helios*
>
> **Frank:** *in general, solving problems.*
>
> *…*
>
> **Rory:** *how does the problem solving come into it? Is it because it's led partly by the client?*
>
> **Frank:** *I think, no, I think if you're given a brief, I just see any brief as a problem that you need to tackle I don't think there's always just an easy like creative solution to – sometimes there is- but then you find that it's been done before so sometimes the problem is doing something original, sometimes the problem is just struggling to come up with a creative idea. Solving problems as well I suppose, on the basis of the client not liking something or changing their minds, it's a problem you need to solve. I just see yeah, it kind of covers a lot of things, creatively, and yeah, the client side of things too.*

This idea of problem solving, as some of the designers have pointed out, goes beyond the tasks for which they are employed and covers a broad range of applications, echoing the *polymetis* noted in chapter three, which emerges from the enlisting of different agencies in pursuit of a particular goal. For Peter, using the analogy of a fire, the design process or thinking about things through design is something which is ubiquitous:

> **Peter:** *I think design possibly does influence the way you look at life, so, design process in particular here, you're talking about designing a product but you have client meetings and get feedback from what they say and you reach a further decision, that's basically the fundamentals of life, in that you see a fire, you analyse what it does, what you think it should do, you then touch it, realise it's hot, so going on from that decision you realise you probably won't touch it again, and it needs to go somewhere where it's safe for it to be, so that's similar to the client feedback or looking for …keeping with fire, you've got a brief that you need to keep warm, how are you going to do that, are you going to light a fire? So that process probably, if you're a good creative thinker and designer, that probably leads well to you, well maybe not better in life, but in certain aspects you're more attuned to…*

Peter's analogy of the fire suggests that a design process of problem solving, coupled with social or material feedback (either the client doesn't like it or the product doesn't work) is something intuitive, or a set of skills regularly practiced by everyone. Carrying this idea forward, design thinking offers a source of value for the designers, as well as a something critical in their own formation of a collective identity (Thévenot, 1984), which may even be challenged or come under threat, as Howard describes:

> **Rory:** *okay, moving sideways, what is design thinking to you? Does that word mean anything to you?*

> **Howard:** *yeah, it's something I'm a little sceptical of, just because I think it kind of became a buzzword two or three years ago, I think people just got a little silly over it, but I think it is extremely important in that, I mean design thinking is just, I look at it as a way of approaching everything, it's really just having design as we understand it in mind, as a consideration when you look at different problems, and I think that's important, design thinking really gets important when we look at how we disseminate it to clients and people who aren't necessarily designers.*

As Howard's comments display, design problems are not just individual issues, but are rather socially informed. Howard goes further to describe how design problems are further complicated by technical objects:

> *I think ...we're kind of at a stage where... as design moves forward as a profession, if it's going to get stronger in this age of kind of ubiquitous technology, rather than just get picked apart and eventually just be scraps of you know, kids with Photoshop making garbage, I think we really need to sell the wider public on design thinking as kind of a way of being, something that is tangible, something that has real serious value and yeah that is what you're paying for. You know when you're employing a designer you're not hiring them to put your company's logo and some shit stock photo on a little space on a screen, and some companies are and they always will be, but that's just who they are. But design really, when you're employing a designer you're bringing on somebody who has this way of looking at things and has this capacity for design thinking, and you know can apply it you know, unlimited problems, situations, and it's something that we've really got to press, it's something that has real value moving forward.*

In response to this technical encroachment, Howard describes design thinking and the design process as a "way of being", not dissimilar to Cross's description of a designerly way of knowing (2001), and is conscious of the different technical forces, noted in chapter three, which might may shift the balance, whether that force is technology threatening his craft or other poor designers bringing the practice of

design into disrepute. As I have argued in chapter three, an awareness of the different assemblages of technical associations does not diminish the role of technical choice. Richard Sennett (2008) is right, for example to note that even modern views on craft carry a strain of anti-technologism, and an uncertainty as to how human action and mechanics of mass production fit together as they continue to develop (Ellul, 1965; Simondon, 2017). Such concerns should not however, invite a retreat or enclosing of human from technical affairs. As the necessity of design thinking shows, it is rather that more reflective solutions must be sought.

Design thinking then, presents itself as a problematic concept which, in direct contrast to the received wisdom of the creative individual, gets to work in blending the different signs, things, thoughts and actions present in the technical assemblages. For this reason, it is on the one hand roundly rejected by designers who do not wish to see what they consider the challenge and value of their work diluted or too rigidly defined, yet on the other hand it offers an attempt to articulate a process through which creative work can be navigated. In terms of its scope, design thinking is something that is both personal to the designer and pertinent to the practice or doing of design, and it is perhaps attempts to remove or alienate it from either which draw the most indignation from the participants in the Atlas and Helios studios. It is clear from the above descriptions that the different resources required for design thinking, along with the axiological implications noted by Rittel and Webber (1973) and Croney (2005) represents a separate image of the creative process than the current organizational image presented in chapter four.

Prototyping

In a similar vein to design thinking, an awareness of prototypes is present, if somewhat peripheral to organization theory. Perhaps more familiar is the idea of boundary objects, of which prototypes have been an important empirical touchstone in describing how objects help actors engage in social relations (Suchman, Trigg and Blomberg, 2002; Bechky 2003a, 2003b; Carlsen, Clegg and Gjersvik, 2012). Taking their lead from STS scholarship, organizational studies have described boundary objects as vehicles for translation across different times and spaces, providing both a boundary and degree of flexibility to allow actors to engage in different roles and create new meanings (Star and Griesemer, 1989; Simpson and Carroll, 2008; Nicolini, Mengis and Swan ,2012). There also exists the less well-explored idea of prototyping as a set of actions or activities which when dealing with fast moving situations or complex knowledge structures, may offer some benefit (Naumann and Jenkins, 1982; D'Adderio, 2001) to our understanding of its use. Sometimes described as shorthand for innovation, prototyping then refers to the practices of experimentation, development and refinement before a fully-fledged innovation can be said to exist (Carlile, 2004). Whilst prototyping can be a complex activity, it is also true that basic or rudimentary prototypes can prove a valuable design technique, as noted by IDEO's Tim Brown: "I have seen software interfaces mocked up with Post-it notes long before a line of code was written" (2009, p.92). Prototyping may be thought of, in its most basic sense, as a process of "building to think" (Brown, p.87). In line with this suggestion, Carlsen, Clegg and Gjersvik (2012) advise that

prototyping is useful because "we must first act to make sense of what we are doing" (p.142) and propose a process of 'double rapid prototyping' with the aim of getting as many ideas into a testing phase to allow further iterations to emerge.

Within the Atlas and Helios studios, the techniques of prototyping raised different issues. In the Atlas studio, which operates as an open prototyping facility, prototyping was attached to a broader discussion on what technical objects should be used to make different products and the designers place within the manufacturing process, as Sarah outlines:

> **Sarah:** *(describing the Atlas studio) I think it's a place where they can have the machines to make prototypes, and I think Atlas as a company needs to make that clearer, our tagline outside is a prototyping facility, but people come in wanting it to be a print shop or a final production facility. But the value in it is that you can test ideas out and play, and design and talk to different people and test things and it's got all the facilities here… even if you think you need, I don't know a laser centerer to make your prototype, you probably don't, you can probably make something just as useful with a laser cutter and made out of 2D parts that fit together to test it to some extent, I think with the range of machines here there's enough to test any physical idea really to be honest, to an extent, enough to show it to people and test out some shapes and sizes, and the interaction with it as well, and is it useful.*

Prototyping, as Sarah's comments show, is a matter of technical choices noted in chapter three, a matter of determining which properties to avail of.

> *I think once you've got a prototype you can give to people, you might have been harbouring this idea in your head for years thinking it's great and you've asked your friends and your family and they've been like oh yeah it's great, and as soon as you've got a prototype and you take it to a group of people that don't know you, they might just be like no its shit, I wouldn't buy*

that, and then you've saved yourself a whole lot of time and money by not making it.

As Sarah suggests, the value of prototyping is in its experimentation (Brown, 2009), and attempting to leap to the final design often leads to bad products. In the Helios studio, which focuses primarily on graphic design and conceptual development, the idea of prototyping took on a similar emphasis, as Simon explains:

Rory: *when we think about product design, we obviously have a stage of prototyping, you know where you try things out, in terms of graphic design and doing work that's maybe not as tangible as product design do you think there's still that prototyping element or experimenting? I mean or do things come out in a one-er?*

Simon: *there's definitely a prototyping element, especially the way we work at the moment,*

Rory: *do you mean as a studio or?*

Simon: *as a studio, we try and present things early on as ideas, that are not too finished, not too precious, and I think it's something that, something that I didn't learn very well early on was this idea of not being too precious about your work, but that's really important,*

…

you know it used to be what I thought was the way it should be , and I think that confidence helps you get into design but you quickly have to get rid of it, I think it's really important that you're not too precious and you take all your experience but you don't think that's the only way it can be because that's just never true, there's a million colours it could be, a million ways it could be….

As Simon describes it, the process of prototyping and the formation of prototypes helps guard against one of the challenges of design; to avoid letting individuality overcome the design process by opening up the design to others. The process of prototyping also then serves to solidify the design process, as successful prototypes are the presented to client's potential routes, as Simon explains:

> **Simon:** *but then after you've gone through negotiation and everything and you've really understood the brief and what they're trying to do, at that point if you've found a really good solution, that you really believe in then you should try it, you should try and put that through and*
>
> **Rory:** *fight for it,*
>
> **Simon:** *yeah you should fight for it, and I think you should fight quite hard for that even when it's a bit uncomfortable, and it can affect the relationship with the client, and its not really worth it if it comes down to them just winning everything and making all the major decisions, what's the point? Unless they're a brilliant designer (laughs)*

As suggested by the theories of technique, technical objects such as prototypes can be used to guide processes (Suchman, 2000; Simondon, 2017). Within the process of design, the prototype can alternate between a point of discussion and location for experimentation, and on to a fixed representation of a (generally limited) set of options offered to a client, acting as both a space for experimentation and a boundary. The process of prototyping and engaging with technical objects also presents a challenge to the designer, who may also change in the process, swapping properties and forming new associations with the objects themselves. Consider the potential danger Simon describes on his role as a designer when sharing ideas:

Rory: *I'm interested in internally, not being precious about ideas and sharing them early. I'm sure in one sense that's quite hard, at the start to develop that openness?*

Simon: *that's true, one of the things, one of the dangers of sharing ideas early is that you… even internally in the team people might not quite get what's in your head, and you can be really excited about something that nobody else can see at all, but again that's where you've got to decide this is a really good idea, I'm going to keep punting this until they buy it, until somebody else supports me in this, because I just think this is brilliant, and you've got to back it up if you think it's really good. But yeah, it's a real tension isn't it, because you've got to be prepared to let things go and just try something else, I think that's the key, is willingness to try something else, before you decide this is the actual… although occasionally, I'm contradicting myself here but occasionally you just get the idea and just know that that's what they should do and it's such a good idea and it's so rare to get such a good idea, that you just think… you can't even focus on other solutions because that's it.*

Rory: *and in what proportion do you think these happen?*

Simon: *that's pretty rare, its' just coincidences that come together and marry into this perfect solution that you're just like this is really good, you can't force it, you see a lot of design where they've tried to force something that replicates an idea from somewhere else, where it was more natural*

As a step in the process of making new things, prototyping may also be used to describe a series of practices or orientation towards producing something new when the potential for different routes are still available. It is also important to note, as Simon's account suggests, that prototyping is not limited to certain classes of material objects, but can refer to anything in its early stage of development (D'adderio, 2001; Brown, 2009; Carlsen, Clegg and Gjersvik, 2012). Take for

example, Anna's description of drafting and producing a handout to help clients get to grips with the computer numerical control (CNC) machinery in the Atlas studio:

[*In a separate studio space used to house lager machinery, Anna and I are discussing the development of a new guide to help users best use certain types of machinery*]

> Anna is working at the computer in the office above the workshop floor, as I ask her what she is doing:
>
> **Anna:** *So right now I'm working on preparing a handout for a CNC routing workshop, so I'm going to go through all the steps of what we're going to be asking them to do tomorrow, take screengrabs as we go along each time and write up the instructions, so that they have a handout that they can follow as they go along.*
>
> **Rory:** *why do you want to do that here?*
>
> **Anna**: *Two reasons; all the software for the CNC routers is here, and I could do the vCAD* (virtual Computer Aided Design) *stuff back home but if I miss a step or something that influences stuff here, and obviously I have (the participants) on hand here because they're the ones who are going to be doing the thing tomorrow, so Gregg and I have already run through it once, hence how we made that, and there's another smaller version that I've got at home, that we'll bring in tomorrow as well.*
>
> **Rory:** *when did you do this?*
>
> **Anna:** *so, it was about a month ago, which is probably around the time when I should have written the handout (laughs) things don't work out that way.*

The production of the handout, whilst appearing to be relatively simple, actually requires a number of different decisions to be made. Firstly, as Anna describes, she needs to plan out the entire activity on site, as although she has the software at home,

there is more to the process than issuing commands. Anna also wishes to factor in other opinions, as certain types of knowledge may need more explanation than others, as we continue to discuss:

> **Rory:** (pointing to a notebook and example end product) *…and are these your notes from it?*
>
> **Anna:** *yeah these are notes from my…*
>
> **Rory:** *so would you say this is your plan?*
>
> **Anna:** *these are... these are notes* (fig.11) *I was taking while I was going through it the last time, so this is how/what should end up being in the handout, yeah.*
>
> **Rory:** *are there any other considerations you need to factor in, in terms of someone showing you how to do it, you taking notes and then what needs to go into a handout?*
>
> **Anna:** *so, well this one in particular, this is the reason why I'm writing it up, because I don't use CNC routers on a regular basis, so I'm coming at it from the point of view as a novice…so I, if there's bits I don't understand that's why I've got the guys here to ask them. Because if there's bit I don't understand I can guarantee the applicants won't understand it tomorrow, at the same time there's always going to be questions that come up on the day that… but that's why they have the handout and they can take extra notes if they have…*
>
> **Rory**: *At the moment Atlas has obviously for each course it has something like this, but then you also sort of have this… I suppose you now have a collection of those things to show people how to use them, how do you see that fitting in with what Atlas wants to do?*
>
> **Anna:** *so well yeah the idea is that as we grow the network these could actually be transferrable, so potentially if Atlas 2 wants to start teaching*

Figure 11: Anna's notes for the manual and proposed object

some of the workshops that we're teaching , they can sort of get the handouts and stuff like that and we can do actually train the trainer stuff with them, still showing them… this is the first time we're running this one, the handout that's going to be the result of this one, is not going to be the final handout for the long term.

Anna describes how the works will help shape future design activities, then continues to describe her own next steps in their development:

After this one, I'll pick up on things that have gone wrong, and I'll modify it for the next time, so like the setting up files for laser cutting, and sometimes the first time is when you notice those problems, the setting up for laser cutting I've run 3 or 4 times now I've got a handout for it, yesterday the particular group that we had I think a few of them were less computer literate than others or hadn't had the habit of understanding things like editing paths and stuff like that, and so they were particularly struggling, so I'm going to review that handout again tomorrow, make it even more comprehensive and sort of skip out bits that aren't necessary, maybe for someone who's new they don't need to know that and someone who knows it will probably do it automatically anyway.

As Anna's description suggests, prototyping, while necessarily focused on one item (in this case the CNC handout) inevitably involves a series of other items (notes, software, working models) and also incorporates ways of thinking (who is it for, what should it achieve). The process of prototyping involves a relational dimension (Schön,1991), and Anna is clear that producing the handout on her own without the help of other technicians or potential clients will result in a lower quality end product. Anna also notes that the development of the handout is likely to be an on-going process, that the prototype will reach a certain stage, be tested in practice and then likely returned to the drawing board for further development. I asked Anna if this was true for most of the machine guidelines within the Atlas studio:

Rory: *how many… and is that the case with all them, you've had to draft and draft*

Anna: *yeah definitely…laser cutting has been the easiest one, we haven't had to redraft it but were going to have to now because we've got new machines, so it's not going to be suitable anymore. So that one…3D printing we've had to redraft a few times because there's so much information and at the same time it's about sort of giving all the information for people who are really interested but also not drowning them in information, sort of finding that balance, it can be a bit tricky sometimes.*

Anna is clear that both will be engaged in –ongoing development. In the case of the laser cutter, this is attributable to new machinery, however for the 3D printer, it is something more complicated, relating to the amount of technical information required. There may also be aspects of knowledge, in a similar vein to the *polymetis* (Latour, 1994a) of technical action noted in chapter three, which this process seeks to capture:

Rory: *and I'm just thinking specifically for CNC, I mean I know you're looking for the technical information, but I'm sure there's also some non-technical bits that come through today, if you're looking for their experience with machines*

Anna: *yeah*

Rory: *is it a case of just knowing how to use it?*

Anna: *well that's where we're sort of trying to figure out how much information to put into the handout or not. What I aim to do is I aim to write the handouts in a way that someone who has run through the workshop can come back and have a go at doing the same thing without me being there, and have the steps to follow and redo it with someone on hand if they get lost a bit or whatever, but that they have something there that they can refer back to then there's, once you start using the machines there's going to be lots of*

other things that, I mean today we're focusing on v-carve, which generally is the, it's a 2D CNC routing,

Rory: *it's the one you watch from the screen beside it?*

Anna: *yeah, so, but you also have 3D cut, and you have another one that's for 3D CNC routing, so when you're doing 3D milling, which work differently, and were not going to even touch on those, at this time, but potentially we could develop a workshop in the future that focuses solely on that and then there would be quite a few editions of CNC routing, so could do a CNC routing one a CNC milling one, do one that's specifically on furniture, so looking at different considerations, making very small things, so it's quite easy to set up all your things but then if we did a larger one on furniture then we'd be focusing more on how you fit things onto a sheet, how you distribute your cutting paths so all sorts of, there's all sorts of different layers of knowledge were you sort of… this is our first one, were it's the most basic it can be…*

For Anna, prototyping involves producing something with an eye to how it will change in the future. As she suggests, there are "layers of knowledge" around the use and interaction of people with machines, always leaving room for refinement and further expansion. As I have noted in the dimensions of technique, such knowledge may be rational or precise, yet may also fall into something else: The Daedalian *polymetis* of technical engagement. These features, and the others described above, suggest that the concept of prototyping holds more promise for theories of organization and creative work than typically recognised. In opposition to focusing on already deemed successful "creative products", a focus on prototyping reveals more of what the creative process within organizations may entail. The perspective of prototyping, as a future orientated expectation of change and a willingness to open up objects to the different social and material forces which may help shape them

further, offers some useful suggestions to what a design approach to organizations can offer to process organization studies.

Structured Improvisation

The final aspect of design I wish to examine is structured improvisation. The act of improvisation has long held the interest of organizational theorists, and is regularly referred to in literature regarding creativity, change and innovation (Weick, 1998; Hatch, 1999; Kamoche and Pina e Cunha, 2001; Vera and Crossan, 2004; Orlikowski, 2000). Within the context of design, a question may be raised as to how acts of improvisation emerge from the will to form (Burrell, 2013), or, how improvisation takes place within the constraints organizations place around it. One possible route for explanation from the perspective of technique is to ask how technical relations provide the crucial stability for ideas, allowing their interaction, whilst also remaining flexible enough to facilitate change. In this section I shall argue that instances of structured improvisation reveal the temporal qualities (or *timings*) of techniques and technical objects (Jones, McLean and Quattrone, 2004); an aspect which can be overlooked when emphasising the ideational nature of such improvisational activities.

The particular instance of structured improvisation I shall examine is the opening segment of a team brainstorming session undertaken in the Helios studio. Although a regular occurrence in design studios, the idea of brainstorming has received mixed receptions in organization theory. During its growth as a management tool in the

early 1960's, (see Osborn's *Applied imagination* (1958) as the source for much of the initial excitement) a number of research programs set out to establish if the technique yielded dividends and which variables could be altered for its improvement. These approaches met with a limited degree of success, reflecting badly upon both the research and the concept (Paulus, Dzindolet, Poletes and Camacho, 1993). A more productive, albeit less travelled approach, as evidenced by Sutton and Hargadon (1996) was to recognise that brainstorming was a popular management tool (particularly in design contexts), and that one might benefit from an ethnographic study to determine what uses the technique might hold beyond the generation of successful ideas. The authors found six different results from the outcome of brainstorming activities, not directly tied to successful idea generation, such as supporting organizational memory and providing skill variety for the designers.

I am not directly concerned with the efficacy of brainstorming. However, as a form of structured improvisation in which ideas (regardless of their success) are developed and formalised, it presents a useful activity to examine the techniques involved in their realisation, as witnessed in the Helios studio:

[In the Helios studio, the team gather on the mezzanine to discuss a potential opportunity for a high profile project. A separate table has been designated for the activity, with pens, paper, notebooks, post-its, copies of the brief and a laptop at the ready. Dan, a senior member of the team, begins the session remotely via skype, outlining the structure of the activity:[2]*]*

> **Dan:** *so guys just to be brief with this, shall we talk about the process of a 30 minute brainstorm? So we're already late so we have to be quite strict.*
>
> **Simon**: *yep, lets do it,*

Dan: *okay, ideally, we give 5 minutes for the brief, 5 minutes to discuss, question, then you have 10 minutes coming up with ideas, then you have a final ten minutes fine tuning them, is that right?*

Simon: *ten minutes ideas, something like that*

Dan: *Yeah, the idea is in the ideas section which is the third bit, everybody can chuck out ideas and you're not allowed to really discuss them, so everybody just throws all the ideas on the table, and then that last ten minutes is to use to fine tune them. What would really help is if somebody had bits of paper you could stick on the wall for them.*

Simon: *yeah we've got them, and we've also printed out all the visuals that you sent over.*

Dan: *okay*

Simon: *just for reference.*

Dan: *cool, well Simon do you want to take us through the brief or do you want me to do that*

Simon: *to be honest I can take it through but I think you've got a better handle on it at the moment, you go for it man. 5 minutes!*

Dan: *okay*

Frank: *begins now!*

Jenny: *go!*

Simon: *go!*

Before the structured improvisation begins, it is interesting to note the setup of the room and organization of the designers. Firstly, the designers have taken themselves away from their usual workspaces to participate in the activity, creating a bounded area for the task. Dan has taken charge of organizing the activity, and is keen to

emphasise the strict time frames for each section. The table is also covered with notebooks, post-its, markers, a couple of laptops, and as Simon mentions, copies of the brief they are discussing. What is immediately clear, though often neglected in the analysis of such activities, are the technical resources already present. The technical objects for capturing and representing the ideas and information are all present alongside the social coding put forward by Dan (5:5:10:10). It is this set up which will allow the designers, with their resources at hand, to *"throw all the ideas out on the table and fine tune them"*. Returning to the activity, Dan is outlining the brief:

> **Dan:** *okay basically we've been asked by the Executive to do a mini competition for the Carnival. The Carnival, as I'm sure you guys know, is coming to the Parthenon (located in Athens) next year… I think what's interesting about Athens being a choice is that so many, such a high proportion of Athens based artists have won this, so they recognise maybe that there's quite a scene going on. Now what we've been asked to do is to do a mini competition, so this is part of the framework we are with the Executive, and what they've asked us for is the…usual shit like methodology and account management , forget about that, they don't read it, but I'll handle that side of it, they've also asked for a creative submission, and that creative submission is to do two posters, and that's kind of all they've given us.*

To recap, the Helios studio have been invited to pitch for an arts project visiting the city. Dan has laid out the brief, and now turns to the approach:

> *Now again, that's kind of up to us what we make of that, and how much we want to do. In brief, the two posters represent the two phases of the campaign, there's phase one, which is advertising the Carnival happening in the Parthenon, before the shortlist and kind of inviting people to submit their own entries, so that's kind of like the call for entries, an advertisement. And*

then the second phase is when they've narrowed it down to a shortlist of four, so I think you guys might be aware of the Carnival which just happened recently, there was maybe 3 or 4 months of advertising and news press about it when we all knew about who the shortlisted four artists were. So that's the general background. So to give you a more specific background to what we've got to do here, they've given us, we have to stick by the Carnival's new brand guidelines, now it looks to me like last year was the first year they used it…

Dan: *yeah, and it looks like they're using a typeface identity from the Spartan identity… but we need to use it, we need to stick by it. We also need to push the brand of the Parthenon as the venue, there's a whole bunch of other logos, so on the main poster were going to have to put all the other supporting logos so, I think it falls into the bracket of Carnival no1, Parthenon no2, and then kind of, you've got a combination of Spartan brand then all the Executive shit. To give you a little bit more background as well guys, the community aim here is design needs to be aimed at wider general public so we can't be too snooty and art focused…*

Frank: *yeah*

Dan: *they're mainly aiming at Athens, 45% people in Athens, and then 18% Attica, and then the wider 10 and 12% people outside nationally. It's to raise awareness for the Carnival, it's to strongly feature the Carnival logo, it's then to feature the Parthenon as I've kind of said there, we've to highlight, there's a whole bunch of stuff that needs to go on it so it, and you'll see that from the brief, it needs to have the exhibition opening and closing dates, it needs to have the Parthenon logo, it needs to have the Parthenon web address, it needs to have the Carnival web address, the whole, the Carnival hashtag so it's all in the brief, Simon can have a look at that*

Dan: *then in phase two you need to introduce the 4 shortlisted artists*

Simon: *sorry just a minute… I'm just showing the guys all the logos we've got to include, and the partners and stuff, and that's for both phases,*

Dan: *yeah, they made a point in the brief guys that were not allowed to refer to previous Carnival winners, they're not backwards looking with this one, so in a way it does need to … we've not got many hooks to play with here, we've got their quite static corporate brand, and their brand elements, and we've got all these other logos we need to use, if we were to think of a hook, or a thing, a concept maybe or something we could shape a concept around it's the fact that this is happening in Athens and it's happening in the Parthenon if anything that is the hook. As with all our other…*

Frank: *that's 5 minutes Dan*

Dan: *oh okay, very quickly, I think we need to be conscious like other brands in the cultural art arena, that whatever we do cannot overshadow or look like a piece of art in itself, it almost needs to be something which the volume can be turned down on, in the background, it doesn't mean there can't be a concept or an idea there, but when we come to presenting the artist's work we need to make sure were not doing something which is going to fight or yeah, what's the word, dilute the artist's work. Okay, that's that. Questions?*

To summarise, the brief is to produce two design phases for a popular art competition, Carnival. One advertising program is to show that it being held in the Parthenon (located in Athens), and the subsequent program to highlight the four finalists who may go on to win the competition. Recalling Buchanan's (1992) suggestion that design is primarily concerned with the relations between signs, things, actions and thoughts, it is clear to see that even in outlining the task, numerous relations are already implicated. Dan presents a description of the task, interspersed with his own interpretation of the importance of different aspects, the format of the output, a list of graphics which need to be included, and a series of warnings about how it is likely to be conducted and how certain aspects will be received by the Executive. All this before the supposed improvisation has begun!

Whilst the event is still within the general boundaries of the designer's day-to-day work, a space has been created to undertake this notably open-ended, creative task. Whilst not quite the spaces created by tactical resistance described by Hjorth (2005; De Certeau, 1984), there is a subversion of the normal routine, a different spacing (Jones, McLean and Quattrone, 2004) with the possibility for invention (Hjorth, 2004) which has created a sense of excitement within the team.

With these resources now made public, the other designers are now able to contribute (fig.12), and Simon begins by countering Dan's interpretation of the brief with one of his own:

> **Simon:** ***(referring to the brief)*** *can I just pick out a few things that I thought were important, so for phase one, the things are pretty much what's been said here but the thing was dates were more important than Athen's strong association with the Carnival. Put dates as a key thing in phase one. And then one of the things I've noticed is they are saying Athens's strong association with the Carnival but then in phase two they don't really want to talk about that, they want to talk about what's happening. So if you want to have an idea in phase one that's about Athens, it sort of can't be about the artists, it's got to be about the place, if you want it to carry through, but I guess you can have two different campaigns.*
>
> **Dan:** *that's where the volume thing's important, so we can turn the volume down potentially on any concept for phase two.*
>
> **Simon:** *the other thing very quickly it's just a bit of insight from the Parthenon, they were all about social media, online, featuring the website on everything almost up at the top on that side, so anything that has a social kind of engagement to it is going to be great.*

[Simon notes the main features on post-its and sticks them to the wall (fig.13)]

Figure 12: Designers in the Helios studios discussing options

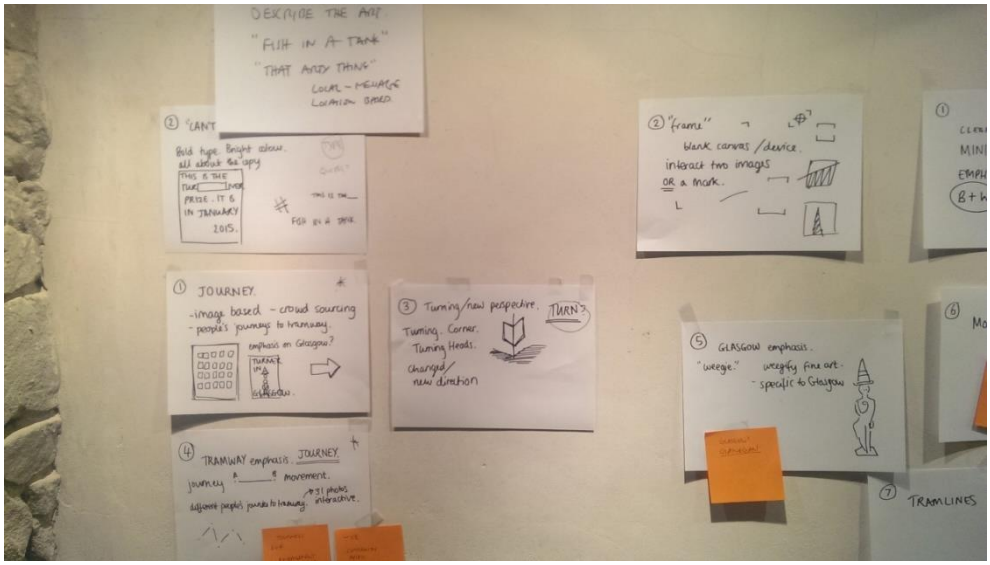

Figure: 13 Potential routes and post-it notes

Simon: *so we've got some stuff up on the wall…Phase one, what is the Carnival, brand ID, Parthenon and the dates and then Athens at the bottom I guess. Phase two, feature artist, exhibition events , no previous winner s in the public and then you've just got a couple of notes to consider: don't overshadow artwork, social engagement #Carnival. That's what we got. Okay, that's the brief!*

Already, a large volume of information has been conveyed, crucially via speech. The designers have begun to highlight their divergent paths and interpretations of what is important, and are already brining in different factors for consideration, such as the references to social media above. In order to regain a sense of control over the proceedings, the designers then adopt a different approach:

Frank: *are we brainstorming for ten minutes?*

Dan: *nobody needs to describe these ideas here, we're not discussing or debating them, were throwing them into the ring and then putting them up on the wall, and then use the last ten minutes to discuss them.*

(Agreement)

Simon: *okay, who wants to go first?*

Frank: *I'll go first then: I'll close my eyes, I'm just envisioning a black poster, white type, and it says, this year the Carnival is coming to Athens 2015, information, these are some logos, blah blah blah… that's it man, its just really kind of stripped back and minimal,*

Simon: *it's like black and white, okay*

Frank: *could be*

Jenny: *it's like focusing on the dates, the information that needs to be conveyed.*

Frank: *but we need to do something tasty with it so it's not just black and boring but information based.*

Simon: *okay so black, almost like black and white's the idea,*

Frank: *not necessarily black and white but I'm just thinking of stripping it back so much that all it is is information, that's it like, and we scrap all the images, scrap everything, get to the bottom of the typeface.*

…Jenny: *so I was thinking maybe something that is a device that allows us to work with the imagery as the fore point, so something that maybe is like I don't know something like a divider, or a way that kind of uses framing, I was thinking photo corners, that sort of thing obviously it's the kind of stuff that's been done before but if there's an interesting device that has a similar technique but something a bit this year…*

Simon: *so it's like a graphic device that says "this is space for an artwork"*

Jenny: *yeah basically yeah, like a blank canvas ,it's just a rough idea, whether it's a line or something or like the edges of the logo being, I don't know, some way of interpreting that, it could be anything so long as it's used subtly as a device rather than, maybe it could be a mark that maybe also translates into how you interact two images together*

Simon: *and you can start off, you can work with and without an image, you can start off with the frame as graphic and then add images later*

Howard: *Yeah, nice*

(They continue to develop ideas and note them on post-its)

…

Dan: *next is everyone to just look at them all and see what ones they like. So if everybody takes like a minute to look at them all up on the wall and pick their favourite ones and then we can start discussing them.*

At this point, Dan has directed the attention of the designers to the post-it notes on the wall, signalling an end to the explanation of the brief and the period of idea generation and stabilizing the key areas discussed. Whilst this stabilizing feature of technology has been discussed in Chapter two, and well noted in organization studies (Czanriawska, 2008), scant attention has been paid to the possibility that different techniques and technical objects lead to different speeds or forms of temporal stability. As Strathern briefly noted, assemblages maintain a "fragile temporality" (1996, p.523) of networked relations, and it is therefore relevant to consider exactly what temporal stability different techniques offer (Jones, McLean and Quattrone, 200). This has been suggested by Lancione and Clegg (2014), who suggest that if we wish to understand the nature of change, we should conside the relative weight of the things in motion: "The heavier the textual and other particulars of ideas that travel, the more problematic is their translation into new contexts. Conversely, the lighter they are, the more they travel and adapt." (p.289). This image has been used to consider a global project, however, might it also apply to a local context? For example, language, itself a product of *tekhne*, allows for the quick transfer of meaning and information. Whilst it has served as a capable means of passing information from generation to generation, it is also true that the vast majority of spoken words leave little trace beyond the conversations in which they are uttered. In a design scenario such as the one described above, with multiple voices seeking to be heard, the impulse to stabilize or add weight to certain aspects is achieved through writing. In the discussion above, the key points of the brief have been anchored by virtue of being written and, literally, pinned to the wall. Returning to the Daedalian artifice proposed in chapter three, the designers will be aware that in order for their

favoured designs to be successful, they will need to add weight in the form of technical objects, just like Latour's key fob serving to remind errant guests of their responsibilities.

Conclusion

In conclusion, this chapter has sought to present an alternative image of a technically engaged creativity through an exploration of the practices and principles of design. Beginning with an overview of the concept of design, I have argued that common misconceptions around the term have hidden its potential as an exploratory concept within process organization studies. To rectify this, I have presented three images of design. Firstly, the science of design, in which I presented Herbert Simon's central tenets for design as a science of the artificial. Following this, I have drawn upon pragmatist approaches emphasising action and the nature of inquiry to present design and process organization studies. Finally, I examined the image of design in relation to the dimensions technique, emphasising the different agencies present within design practices.

Drawing on the experiences of the designers in the Atlas and Helios studios, I utilised the resources highlighted by an understanding of technique to explore three areas of their practice to show how design activities represent a form of creative action which demands an awareness of the different agencies involved. I began with design thinking which, far from being an abstract contemplation of form, the designer's descriptions suggesting something closer to an engaged mode of thinking in the face of the environment and the design problem at hand. Next, in examining the techniques of prototyping and its relevance to design, I have shown that

prototyping highlights the instability of ideas and intentions, a characteristic which also acts as a source of flexibility. Through the process of prototyping, ideas and intentions are brought to bear against the properties afforded by the technical means of their realisation. Finally, the techniques of structured improvisation were examined to identify how these techniques aid the development and decision-making process for generating new ideas by assisting their transfer. An examination of the techniques through which this is achieved exposes the different temporal characteristics of communication and the different technical objects utilised in doing so.

In the next chapter, I draw together the insights developed so far to present address the research question and provide a rough guide to the tangled paths of creative production. What I have termed the dynamics of invention seeks to provide a series of guiding concepts to help understanding into the technical forms of becoming, the Inversions of novelty, and, building on the themes of this chapter, the trials of design.

6. THE DYNAMICS OF INVENTION

Introduction

Having examined the roles of technique, creativity and design, this chapter presents the 'Dynamics of Invention': a series of concepts which, when taken together, form a rough guide for exploring the tangled paths to be found within creative production. In order to synthesize the views presented thus far, and clarify how they help address the research question, the chapter begins with a return to the field of process organization studies (Hernes and Maitlis, 2010). With specific reference to the production of theory, this section considers how a process worldview should inform the task of developing a theoretical framework. To this end, I argue against the inclination to develop strict programs, prescriptions or similarly ordered structures of thought. Although such rigidity can be a desirable feature in the pursuit of reliability, generalizability and validity, it nevertheless leaves certain aspects of organizational life by the wayside (Law, 2004). Critically for this study, the adoption of an overly systematic approach also risks obscuring the Daedalian manoeuvres and intrigues which I have sought to make clear through an appreciation of technique. In line with

current thinking in process organization studies, and the *polymetis* of Daedalus, this chapter advocates an active, mobile approach to theoretical development. Eschewing attempts to account for the totality of the practices observed, this approach aims to develop concepts that can move alongside practice, and instead of mapping the territory, offer threads to guide those attempting to uncover the twists and turns of technical activity.

The first guiding concept presents the 'becoming-technical of organization'. This concept draws upon theories of organizational becoming (Tsoukas and Chia, 2002; Clegg, Kornberger and Rhodes, 2005), to show how techniques contribute toward the ongoing production and maintenance of organizational life (Cooper 1998; Latour, 1990b). This concept makes use of Deleuze and Guattari's (2004) 'becoming-' which seeks to affirm both the pre-eminence of becoming over fixed analyses of being and the different flows and formations its paths can take.[1] The specific path I am interested in is 'becoming-technical', and returning to the agencies, associations and artifice of technique, I focus on how these aspects open up different paths for becoming in organizations, both in terms of the technical environment and the actors involved. Extending the view that technical objects form the underlying sociomaterial infrastructure for human activity (Orlikowski, 2007), becoming-technical emphasises how such objects and their attendant techniques are inexorably involved in a process of continuous, creative organization (Chia and King, 1998; Linstead and Thanem, 2007).

The second guiding concept, the 'inversions of novelty', builds upon the aforementioned process of becoming-technical to extend current thinking on how novelty can be understood within organizational activity. As raised in chapter four of

this study, creativity research is often reliant on a mechanism for attributing novelty to outcomes post hoc. This position is further cemented by view that the ultimate goal of creativity research should be to separate creative from non-creative production (Amabile, 1996). Contrastingly, the concept of inversion points to the complex, and sometimes contradictory relationships to be found within the generation of new forms. Recognising these different inversions of novelty (in which paradoxical or oxymoronic gestures can lead to new developments) allows discussion to return to the processes of reproduction and replication, and reconsider their value as resources for creative production. This guiding concept is then subsequently able to articulate the ways in which novelty emerges from the different technical (and seemingly uncreative) associations and substitutions found within everyday organizational activity.

The final guiding concept, 'the trials of design' asks how, in relation to these processes of becoming-technical and the Inversions of novelty, organizational actors can design well for the future. By considering the different approaches to design, this section proposes that we should not resist the inclusion of different agencies, but rather accept our co-constitutive roles and the possibilities opened up for new relations via technique.

In Search of a Thread: On Rough Guides and Guiding Concepts

Perhaps the most well-known machination found in the myth of Daedalus is the labyrinth, a structure built on the wishes of the Cretan king Minos to imprison the

Minotaur. The labyrinth, as I have noted in the prologue, was so cunningly devised that it presented even Daedalus, its architect, with a challenge when attempting to leave.[2] This challenge was also faced by Theseus, who, intent upon entering the labyrinth to slay Minos' bestial creation, was only able to escape with the help of Ariadne's thread to guide him to safety.

So too in the study of organizations, are we presented with problems or situations which resemble mazes or labyrinthine constructions in their complexity (Kociatkiewicz and Kostera, 2015). It may be, for example, that the organizational terrain is constantly shifting, that paths visited previously no longer look the same, or that new paths are mistaken for old ones, allowing novelty to pass unnoticed. It may also be the case, that these organizational mazes are the result of our own theoretical constructions, rather than extant features of the external environment (Tsoukas and Hatch, 2001; Wood, 2002). As Robert Chia (1997) argued, studies of organization have historically tended towards the production of taxonomies, hierarchies or similarly ordered structures of thought. From a process perspective however, these approaches can stifle and arrest the phenomena they seek to describe, telling us "more about our approach to mapping the complex structures of reality than the processual, intricate, intractable and obdurate reality itself" (Nayak, 2008, p.173). Similarly, John Shotter (2000, 2006) warned that the very notion of producing theories which attempt to accurately map all aspects of reality, "as if we were disembodied, disinterested creatures able to adopt a God's eye view" (2006, p.586), should be treated with a degree of suspicion, lest we find ourselves in a maze of our own making.

Rather than pursuing such certainty, Shotter (2006) argued (and as I have noted in chapter two), theory should aim to produce something that moves alongside everyday events in practice, taking into account its own effects and responsive possibilities. Such concepts would be unlikely to vouchsafe validity, or even reliability if reproduced in different settings, but could assist in uncovering the singular, interesting, artful or messy characteristics of everyday life which can often elude organizational scholarship (Law, 2004). Such an approach holds benefits for the process understanding of technique I have advocated in this thesis, as it is certainly the case that the *polymetis* of Daedalus cannot be wholly understood through an appeal to *episteme* (Latour, 1994a). It may also help to address the question of how technique contributes toward creative practice in a creative manner, thus maintaining a link to the *praxis* of creativity (Jeanes, 2006; Rehn and De Cock, 2009). Pursuing this line of inquiry, it would therefore be a mistake to treat theory as closed off, removed from its own effects. One can never, for example, guarantee the use of any theory in practice, which, rather than operating in the programmatic fashion in which they are designed (Gabriel, 2002), often result in unintended or unexpected developments. The same challenge also exists for the development of process theory, which, if it is to retain a connection to the unfinished, emergent phenomena it seeks to understand, must avoid the temptation to ossify descriptions of reality for the sake of their generalizability or perceived usefulness (Chia, 1997; Nayak, 2008; Helin, et al.,2014).

In commitment to this line of thinking, this chapter will, rather than attempting to map out the shifting labyrinth, seek instead to provide threads to follow, drawing together a series of concepts to aid travel (Simpson, Tracey and Weston, 2018); and

in response to the research question, provide a rough guide to technique and creative practice, termed the dynamics of invention. In keeping with a process worldview, this guide does not intend to offer prescriptions or rigid determinations. As Nayak (2008) argued, such proclamations within organization theory are antithetic to the tenets of a worldview which recognises things are always subject to change. Instead, this rough guide aims to follow Yannais Gabriel's suggestion that organization theory should be *paragrammatic*, entailing "something written down, but not used as written" (2002, p.144). Gabriel describes this process of theory construction, which rather than closed off and prescriptive, should function as "a shifting stock of ideas, routines, images and ingredients which invite improvisation and elaboration, rather than copying or adherence" (2002, p.134). The following rough guide then, aims to provide both a synthesis of the work presented in the preceding chapters, highlighting areas of connection and disjunction, and a number of threads to guide research through the tangled path of creative practice. In what follows, I present three guiding concepts, beginning with the 'becoming-technical of organization', followed by 'the inversions of novelty', and finally, the 'trials of design'.

The Becoming-Technical of Organization

Following the positions raised above, the first guiding concept considers the ways in which techniques and technical objects, often presented as providing stability, also beget change. To achieve this, I draw upon works which emphasise the pre-eminence of becoming (Chia, 1997, 1999; Tsoukas and Chia, 2002; Deleuze and Guattari, 2004), to present 'the becoming-technical of organization'. Recognition of this

aspect highlights the ways the dimensions of technique can support further scholarship within process organization studies.

Becoming, often contrasted (though not strictly opposed to) to the concept of being,[3] emphasises the movement and change which stems from relations created and maintained between different forces (Chia, 1997; Bencherki and Cooren, 2011), offering a way of thinking about change which is not reduced to a step-wise progression of successive states.[4] As noted in chapter one, a central feature of the process worldview is its treatment of entities as effects, emerging from a continuous flow of ongoing relations, rather than arresting this movement and focusing on fixed forms (Law, 2002; Czarniawska, 2008). This feature of process organization studies provided the context in which I developed the dimensions of technique, highlighting the agencies, associations and artifice found within its operations.

How then, can an analysis of technique help further explore this role of becoming in organizations? As Robert Cooper (1998) noted, the many different becomings underway at a given moment can feel close to imperceptible, requiring research to look closely to uncover its workings. Cooper argued that to understand becoming (making particular reference to assemblages of technical objects) it is necessary to look for what is occurring in the middle or in-between (Cooper, 1998; Deleuze and Guattari, 2004). It is the middle of things, rather than their beginning or end which is of interest, consisting of "an active *between*, a *becoming*…the *seam* between inside and outside" (Cooper, 1998, p.112). To be clear, this does not refer to a central or halfway point between beginning and end, but rather to a process driven by the different connections being made. Cooper points to Deleuze's oft-cited articulation of the man-horse-stirrup assemblage to convey this sense of becoming:

> Technologists have explained that the stirrup made possible a new military unity in giving the knight lateral stability: the lance could be tucked under one arm, it benefits from all the horse's speed, acts as a point which is immobile itself but propelled by the gallop. This is a new man-animal symbiosis, a new assemblage of war…Man and the animal enter into a new relationship, one changes no less than the other (Deleuze and Parnet, 1987, p.70-71)

As this example shows, the change is not solely the domain of the technical object or the rider (or the horse), and in this sense (and as Deleuze continues to argue), the becoming is never wholly technological. Rather, the effect –the becoming– occurs in the middle, at the seam where inside meets outside, and where the technical meets the social, material, biological agencies it comes into contact with. This sense of an in-between I argue, allows us to consider how techniques can inform the becoming-technical of organization. It is also in this sense that we find common ground between the work of Latour, Deleuze and Simondon, in their insistence on an *enfolding* of the technical into everyday life (Deleuze and Guattari, 2004; Latour, 2010; Simondon 2017) In order to further develop the connections between these two areas, let us return to the three aspects of technique.

The first element of the theory of technique –agencies– pointed to a central theme that runs through the entire thesis, and to a key theme within process studies of organization (Roubichaud and Cooren, 2013; Carlile, Nicolini, Langley and Tsoukas, 2013). In the preceding chapters, agencies have been considered in terms of their relevance to techniques, in terms of their general exclusion from theories of creativity, and as part of a better form of engagement and inclusion via theories of design. Defined as a "capacity, condition, or state of acting or of exerting power"

(Cooren, 2015, p.475), it has been proposed via the dimensions of technique that we must recognise the different forms of agency, particularly those realised through technical objects, in order to fully understand their shared influence on the process of production. This focus on agency is contrasted both against theories that treat technique as the simple application of schemas, and theories which treat technical objects as an absent presence or exogenous force (Orlikowski, 2009) on human action within organizations. With this in mind, a primary concern has been to consider the specific ways different agencies inform technical activity,[5] and offer greater consideration than has typically been granted to them (Czarniawska, 2008; Engeström and Blackler, 2005; Rennstam, 2012).

With regard to theories of becoming, grounds for commonality can be found in the ways in which the attributes of different agencies appear to change hands in the process of production, described as a process of 'swapping properties' (Latour, 1994a). The image of swapping properties highlights the same middle ground or zone found in-between the agencies which populate the production of new things.[6] As Rachel's descriptions of operating the sewing machine (p.43), and Ryan's descriptions of the laser cutter (p.52) show, there is a crossover in which certain properties are taken and in turn received, forming a space which I suggest should be considered as the proper domain of "the practical knowledge (or knowledgeable practice) of the craftsman" (Ingold, 2000, p.316). Rather than operating as superior to or undermined by different agencies, organizational actors get to work *amongst* them, sharing and swapping different properties, displaying a morphic quality in their bringing together and taking apart of different resources, and never leaving the "terra firma of interaction" (Cooren, 2006, p.82; see also Latour, 1994a).

The value of considering the process of swapping properties though a becoming perspective is twofold. Firstly, in focusing on swapping, attention is drawn away from the problematic "symmetry" between humans and non-humans noted in chapter three, towards a more important feature, namely those human and technical properties are mobile, and that they are *moving*. The movement of different agencies is what determines their relevance to the process of production, defining their capacity to act or exert power (Cooren, 2015) upon the situations in which they find themselves entangled. If they are not moving or changing something, they are not having an effect, and are therefore not displaying agency. Likewise, if such movement is denied or segmented, then opportunity for becoming is also lessened. In the field of process organization studies, this feature of agency is readily understood,[7] and also points to a way in which the resources of ANT can continue to be utilised by process organization studies to consider the different paths of becoming in tandem with other theories focused on technical assemblages (Chia, 1999; Styhre, 2002). Recall that for ANT, a defining feature was its focus on translation (Czarniawska, 2017), which in linguistic terms generally means to make equivalent. However, as John Law also noted, "since no two words *are* equivalent, translation also implies betrayal… translation is both about making equivalent, and about shifting" (Law, 2009, p.143). This swapping, shifting, moving character of agency is what I consider important when examining agency, and also reflects its value for considering the process of becoming in organizations (Hernes, 2010).

Secondly, in focusing on the swapping of properties, a theory of technique is able to recognise that the transformations which occur within production can be *reciprocal*. As Deleuze notes in his description of the man-horse-stirrup assemblage, "one

changes no less than the other" (Deleuze and Parnet, 1987, p.71, as cited in Cooper, 1998, p.113). This feature is exemplified in Frank and Peter's descriptions of using the computer files and software to order their thoughts show (p.53; p.100), as the involvement of different agencies not only impacts the object being created, but also effects the designer in the same process. To further develop this aspect, I have pointed to Deleuze and Guattari's (2004) concept of deterritorialization as a way of thinking about the different ways the swapping of properties has influenced the designers. In particular, deterritorialization highlights the ways in which perception is altered and expanded when properties are swapped with technical objects, and can therefore only be properly understood as occurring in-between and in relation to those objects[8] (Johnson, 1999). The two are therefore bound in a mutual process of becoming, reminiscent of what Marcia-Ann Dobres described as "the processual unfolding of technique and technician" (1999, p.124) in relation to the work of Leroi-Gourhan. A consideration of how properties are swapped and the deterritorializing effects this has on both humans and non-humans then, highlights the connection between a becoming perspective and the account of agencies found in the theory of technique.

The in-between of becoming, as Deleuze and Guattari (2004) note, can lead in many different directions. How does the interplay of agencies form a specifically *technical* becoming? [9] An answer can be found in the second dimension of technique, which described the different technical associations found within the Atlas and Helios studios. In the examples referred to above, I have pointed to the swapping of properties that occur in the process of production. Relations between different agencies, however, can extend beyond these dyadic encounters, as technical systems

often involve the enrolment of multiple different human and non-human actors over time (Gille, 1986; Latour, 1984; Stiegler, 1998; Lancione and Clegg, 2013, 2014). For this reason, it is important not only to acknowledge that different agencies can be interlinked and effect one another, but to extend analysis further to examine the different trajectories of humans and non-humans which the interplay of different agencies give rise to. Drawing on Latour (1990b, 1992, 2005b), these trajectories can be examined through the specific associations (and substitutions) which occur as new things develop.

Once again, a focus on becoming can help inform how these concepts should be best utilised within studies of organization. There is a risk, for example, that in simply identifying the different associations found within production, that accounts may return to the straightforward routes indicated by plans, schemas, or just-so accounts of innovation (Sennett, 2008), albeit with a few extra actors included. Instead, an account of the associations formed within production should focus on their effects and their mobility, pointing to the different mediations, crossovers, and transformations through which creative practice proceeds before reaching the finished product. To avoid losing this sense of movement, I have suggested that alongside recognising the different associations found, an account of their 'ordering' must also be provided (Harris, 2005; Law, 1994), showing how different technical choices and interventions effect and shape the outcomes of production. This can help to uncover the diversity of technical production made possible by techniques. When an end-point is reached, many of these transformations and interventions become hidden, either erased by the producer or rendered opaque behind the solidity or 'concreteness' (Simondon, 2017) of the finished product (Latour, 2002).

An analysis of the associations within technique can then reveal the myriad of different technical choices, delays, wrong turnings and subversions; blockages of certain becomings and potential lines opened for new ones. In place of the certainty found in deterministic accounts of technology, which treat technical objects as dependable and fixed (Garud, Kumaraswamy and Karnøe, 2010), becoming attempts to grapple with the issues of indeterminacy and emergence (Tsoukas, 2009). A focus on associations and their ordering also shares much of the general outlook of scholars who have focused on the creation of paths for new products, rather than examining existing technical dependencies within chains of production. Both recognise, for example, the role and potential for unintended outcomes brought into play by different agencies (Garud and Karnøe, 2003). As displayed in the designer's descriptions of their own position within the process of production, and in their encounters with technical objects (p.49-51), the possibility for new things to emerge lies partly in the transformative capacity offered by the different agencies, and also holds the potential to derail individual intentions.

Recognition of this potential for individual intentions, plans and programs to go awry, leads to an appreciation of *polymetis* and its relevance to theories of becoming (Chia and Holt, 2009). *Polymetis*, the bag of tricks described by Latour, is captured in the third dimension of technique as part of the artifice displayed in the everyday technical actions found within production. The use of the term also emphasises the potentially adversarial nature of the associations and substitutions between humans and technical objects, and can be utilised to highlight the challenges presented by becoming, as the enrolment of different agencies into these processes can work for and against individual intentions.

A critical aspect of a becoming perspective, in contrast to the relative certainty of being, is that future direction cannot be guaranteed to proceed in an orderly fashion (Bergson, 1992). On the contrary, recognition of becoming may lead one to realise the potential for change or new association at any moment. In practice, such uncertainties or unforeseen developments are met with workarounds and tactics to avoid the most damaging effects and maintain a desired course. Whilst studies of organization, particularly those informed by a process outlook, have argued for a need to consider the different types of thinking required to deal with the problems which emerge in organizations, such as practical modes of thinking beyond the 'cool reason' of rationality (Shotter, 2006; Mackay, Zundel and Alkirwi, 2014), these accounts rarely recognise that it is often through the engagement of techniques and technical objects that such issues are resolved. Once again, the myth of Daedalus points not to *episteme* but to *polymetis,* the allying of different forces. In the myth of Daedalus, it is the technical fix or ploy which takes precedence. As the example of the Helios designers using a technical rating system to try and decide on their favoured projects showed (p.72-4) the engagement and subsequent transformations made possible by the technical object (the rating system) altered the decisions taken. The calculations –transformations of decisions into numerical variables– balanced the differing views of the designers, changing the path of their decisions and potentially changing the final outcome.

Taking these elements into account, I argue that the dimensions of technique can address organizational becoming to provide a useful thread of inquiry within process organization studies. Through an examination of how the properties of different agencies are swapped, ordered, and the accompanying subterfuges which provide

further insight into the different paths of becoming. In short, the becoming-technical of organization advocates one such path whereby organization (that is, the process of organizing), is achieved by the relations offered by techniques and technical objects.

The Inversions of Novelty

In drawing attention to the figure of Daedalus in his workshop, my aim has also been to challenge and ultimately draw attention *away* from another figure: that of the individual creator. In this second guiding concept –the inversions of novelty– I revisit these two opposing worldviews, drawing on the arguments developed in chapter four. At the heart of these differing images of the creative process lie two very different conceptions of the nature of novelty, and how it should be understood in relation to organizational production. Building on the arguments developed thus far, I examine how the concept of novelty - understood as something which emerges as an effect of different relations - has been established within process organization studies, and how an understanding of technique can help shed light on the roles of reproduction and repetition in support of this view. This image of novelty is contrasted with accounts which present novelty as either residing in the mind of the creative individual, or as a social judgement imposed on products or outcomes retrospectively deemed creative. As the everyday processes in the Atlas and Helios studios display, there is much more involved in creative production than good ideas. I conclude this section with some further considerations on the relations between technique and different, paradoxical, seemingly contradictory ways of understanding the Inversions of novelty with the resources of a process worldview.

Having described the nature of techniques and their mode of operation in chapter three, I have argued in chapter four that a very different set of principles inform current research into organizational creativity. Despite attempts to broaden its horizon, the field of organizational creativity is still strongly wedded to the idea that creativity is a capacity held by individuals (Glăveanu, 2014), which can be strengthened or lessened depending upon the manipulation of certain organizational conditions (Bouty and Gomez, 2015; Montag, Maertz and Baer, 2012). This focus on the organizational conditions effecting a predominantly psychological capacity for creative idea generation (Anderson, Potocnik and Zhou, 2014) obscures inquiry into the process of creating itself, of which a number of questions remain unanswered (Arjalies, Lorino and Simpson, 2013). Although recent approaches have clearly witnessed a shift away from a focus on individual creators towards group and social dynamics (Montuori and Purser, 1999; Perry-Smith and Shalley, 2003; Hargadon and Bechky, 2006; Harvey, 2014) there remains a suspicion that such dynamics are still viewed as assisting, rather than actively constituting the creative process. The issue is well summarised by Vlad Glăveanu, who concluded that for many creativity researchers, "idea generation is at the core of creative performance and ideas reside in the mind, not 'outside' of it" (2014, p.49; Thompson, 2018). Outside of the mind, of course, lie techniques, relations and the world of technical objects, which find themselves considered either as an afterthought or excluded entirely from much of the current organizational creativity literature.

Underlying this view of organizational creativity is a series of well-worn assumptions on the nature of thinking and doing, which have disconnected ideas from practice and placed them antecedent to their realisation, reducing the process of

formation to mere mechanical implementation. Tracing the historical roots of this disconnect, I have highlighted a conflation of the classical ideas of *tekhne* with *mekhane*, and the subsequent imposition of a mechanistic worldview which has resulted in this separation of creative thought from mechanical implementation (Ingold, 2000). Given the historical lineage of these concepts, it is perhaps unsurprising that techniques and technical objects are often ignored or assumed to have a detrimental impact on creativity, treated as either homogenizing force or brute materiality to be overcome by the creative individual (Latour, 1994a). This disjunction, I argue, also provides the impetus for the modernist image of creative individual or lone creator who, in possession of his creative faculties can bring the material world under their own control (Latour, 2002).

As the accounts of the designers in Atlas and Helios studios show however, such assumptions on the nature and influence of the creative individual may be misguided, as relations with technical objects continually present themselves as a dynamic source for transformation (and frustration!). Consider again the designers' own descriptions of their role (p.49-51; p.60-64), which emphasised the different connections between various actors as crucial to their success. Likewise, the designs developed by Peter and Paul are made possible by the design software and machinery (p.100), a feature also recognised in the relations between the Helios designers and their clients. The reliance upon and use of techniques which incorporate such objects, highlight that to produce and understand creative products and outcomes, one must take the technical environment seriously, as the processes of creative formation can often depend upon them.

The image of the creative individual, therefore, is one that I believe should be discarded in favour of an image which more accurately reflects the challenges and opportunities presented by the different agencies which populate organizational life. This is also Latour's view[9], who argued that "*Homo Faber* is a Homo *fable* through and through, a retrospective projection into our fantastic past of a definition of matter, humanity, mastery and agency" (1997, p.75). To reject the image of the creative individual however, is to also to reject much of what is traditionally understood as the domain of creativity and creative action. This is particularly true for the areas of novelty and originality, which, in contributing towards the 'new and useful' criteria, form the paradigmatic features of the organizational creativity literature (Driver, 2008). In chapter four I have discussed the difficulties in the current organizational approaches which view novelty as something which belongs entirely to the individual and as something socially defined after the process of creation. Granted, the social process of separating creative from non-creative outcomes has a certain appeal, and there are of course 'creative' things which are either historically contingent (Amabile, 1996) or determined by the actors within a particular social milieu (Csikszentmihalyi, 1999). However, there is also something else, something which not only evades these current organizational approaches, but may be actively obscured by their focus on the social process of attributing novelty. I am referring to a different image of novelty, one that seeks to capture the unfinished, ongoing and emergent nature of organizational activity, and how this feeds into the production of new things (Garud, et al., 2015). As Chia and King have argued, "[b]eneath the apparent, rational approach" often described by studies of organizational creativity and innovation, "there is a substratum of flux,

indeterminacy and openness which is frequently suppressed or denied" (1998, p.474), which process studies must aim to engage with. In extending analysis beyond the creative individual and into the world of technique, I argue that opportunities to better understand this ongoing "creative advance into novelty" (Chia and King, 1998, p.475; see also Whitehead, 1929; Styhre, 2006) become apparent.

In support of this goal, it will be useful to make clear exactly what a process view of novelty entails, if it is neither a strictly psychological phenomenon (Boden, 1992) nor a social judgement inferred upon the outcomes of organizational production (Amabile, 1996; Csikszentmihalyi, 1999). As I have noted in chapter four, for Alexander Styhre (2006), a common sense understanding of novelty as something which distinguishes new from old is of limited value, as all products or outcomes were once new, and everything new emerges from something which already exists (old) rather than *ex nihilo*[10] (Chia and King, 1998). This common sense understanding of novelty is therefore "not the central component of creativity…Creativity is an act of making connections and constituting hybrids" (Styhre, 2006, p.148). In his critique of current approaches to organizational creativity, Styhre builds upon this view to form an empiricist image of novelty (2006), which does not rely on social judgements and presents an entirely different set of considerations for the field. Indeed, Styhre goes as far to state that an empiricist image is less concerned with whether something is original or new, and instead focuses on the "connectivity, associations, assemblages and multiplicities" (p.148) which underlie the combinatory nature of the creative process. In Chapter four, I have highlighted similar arguments from Rehn and Vachhani (2006), who have problematized the ability to distinguish new from old, and Latour and Lowe

(2011), who -contra Benjamin- have argued convincingly on the effects subsequent reproductions can have on our perceptions of the "originality" of a product or outcome. These alternative prospects for the study of what is new, original or novel are perhaps, all less appealing due to their lack of recognition of the secondary criteria for studies of organizational creativity that outcomes must be new and *useful*. As critical research has suggested however, this conservative position betrays less of an interest in the nature of creativity than a desire to efficiently capture and direct it towards the aims of an organization (Drazin, Glynn and Kazanjian, 1999). Creativity however, can be as destructive (Sørensen, 2008), deviant (Mainemelis, 2010) and useless (Driver, 2008) as it can be valuable, directed and useful. Recognition of this state of affairs may open up a more realistic image of how creativity emerges within organizations.

Such insights lead to the second guiding concept, which seeks to capture these supposedly uncreative acts through an appreciation of the 'inversions of novelty'. The Oxford English Dictionary defines inversion as a "transposition" or "reversal of position, order, sequence or relation". With reference to inversion, this guiding concept can be used to examine how seemingly repetitive, everyday, or technical processes can all contribute to the generation of new forms. However, as process accounts of organization stress, such inversions do not indicate a radical disjunction nor a break from the past (as often emphasised by accounts which read creativity 'backwards' (see Ingold and Hallam, 2007)). Instead, it is something continuously emerging. Radical novelty, insofar as it can be distinguished at all, is more likely to be realised *after* the process of creation, as it is a quality which is determined in part by its after effects.[11] Thus, an insistence on trying to separate creative from non-

creative production (Amabile, 1996) or original products from subsequent copies obscures a more complex reality in which the two are related in surprising ways. Latour and Lowe (2011) point to an aesthetic example of this feature when discussing the original Mona Lisa, arguing for the role the copy plays in our perception of the original. Posing the question as to whether Da Vinci's work would receive its current adulations without the proliferation of its copies, they reach the following conclusion:

> Thus, the real phenomenon to be accounted for is not the punctual delineation of one version divorced from the rest of its copies, but the whole assemblage made up of one —or several— original(s) together with the retinue of its continually re-written biography. It is not a case of "either or" but of "and, and" (p.4)

When considering the role of technique in the inversions of novelty, this complex, even paradoxical view can be of value for two reasons. Firstly, in rejecting the image of novelty as a radical break with the present, we are also able to do away with the unrealistic of the individual creator pitting themselves against the material world and supposedly making the world anew in his own image (Sørensen, 2008). Secondly, analysis is opened to a series of concepts essential for understanding techniques, namely, repetition, reproduction and replication. As philosophers such as Kierkegaard, Tarde and Deleuze believed, there is a hidden difference within repetition which problematizes simple distinctions between new and old, and (for the purposes of this study) creative and non-creative production. As I have argued in Chapter four, this feature is largely obscured within the mainstream creativity literature, which often waits until products or outcomes are deemed creative before analysis.

Reading creativity ‘forwards’ however, and including the different agencies found within technique invites an analysis which considers how supposedly uncreative actions lead to creative outcomes. In Rachel’s process of producing the Chinese box, described in Chapter Three (p.121-128), the process of creation utilizes multiple repetitions and replications of pre-existing forms. Novelty, then, need not always concern itself doing away with what already exists. It can also consider the different connections formed between pre-existing objects and processes, the “associations, assemblages and multiplicities” (Styhre, 2006, p.148) made possible through technique. From this perspective, analysis of the Inversions of novelty via technical means can proceed.

Process studies of organization seeking to further explore the inversions of novelty without post hoc judgements of novelty or pre-existing commitments to identifying usefulness can benefit from both an awareness of both reading creativity ‘forwards’ (Ingold and Hallam, 2007), and of the technical inversions which contribute to the formation of new products. It is within these crossovers, activities in which different agencies are engaged, that we find the materials from which new products and novel outcomes are created, providing the grounds from which to study the in-between of that which does and that which does not yet exist. Such inversions however, are not necessarily filled with flashes of inspiration or individual brilliance. Accounts which reject the predominant narrative of new and useful creativity are more often concerned with the iteration and inventiveness that comes from repeating actions (Osborne, 2003), exploring the properties and material characteristics of different agencies (Miettinen, 2006; Gherardi and Perrotta, 2013; Tanggaard, 2013). The study of techniques may therefore open up opportunities to further develop a process view

of novelty as something continuously present and emergent within organizations (Chia and King 1998; Shotter, 2008; Hussenot and Missonier, 2016).

The Trials of Design

The final guiding concept, 'the trials of design' asks how, in this changing, uncertain world of different agencies, associations, inversions, novelties, detours, ruses, negotiations and artifice, it is possible to design well for the future. In chapter five, I presented the techniques of design as a potential salve to the shortcomings found within the literature on organizational creativity. Whilst design clearly holds such potential, particularly as a means of exploring the relations between signs, things, thoughts and actions (Buchanan, 1992), I am also conscious of avoiding a form of utopian thinking in which problems are simply 'designed' away. As should now be clear, the creative path of the designer can be more perilous, less secure, and ultimately more open to uncertainty than those found in descriptions of individual creativity or genius. The inclusion of techniques, technical objects and the recognition of different forms of novelty open up space to consider alternative ways of understanding the creative process, including the designer's role within it. Such inclusions also, however, reveal the trials of design and the challenge of designing in a complex world of different forces, which I shall explore in the following section.

In contrast to a focus on the creative individual, a discussion of the techniques of design reveals a different way to consider production and the challenges faced when trying to create new things. This alternative however, is not without its own issues. In opening analysis to the impact of other agencies, the idea of design must grapple once more with the issue of human exceptionalism in the process of production.

Does the inclusion of different agencies lessen our own human efforts? Efforts which, in the face of such agencies, appear fallacious in their assumptions and attempts at mastery and control? Does this alternative image, in the same manner as Actor-Network theory, also amount to the same "dissolution of humanity" (Latour, 1999b, p.16) originally levelled against its predecessor? Are we content with giving ourselves over to the "twists and turns" (Chia and Holt, 2009, p.200) of events? As I have noted in the previous section, doing away with the image of the creative individual may also mean doing away with straightforward answers on how new things are created, and consequently, how we should understand the role of design and our role as designers.

By way of response to these questions, Latour's own defence against this charge is once again worthy of further consideration. Latour (1993) suggests separating humanity from the different forces it inevitably gets mixed up in is more likely diminish, rather than elevate it. As argued in chapter three, to be human for Latour is to be "a weaver of morphisms" (1993, p137), and in erroneously trying to protect humanity from different agencies "one does not defend humanism, one loses it" (1993, p.137). This underlying view and definition of the human as "a weaver of morphisms" is one which accurately fits the actions of the designers, and which also points to the universal experience of designing, of drawing things together in the aim of achieving a specific goal or outcome (Flusser, 1999; Burrell, 2013). A recognition of the different agencies of production via technique is therefore not an attempt to deprive humans of their own capacities (Cooren, 2015), nor to homogenise human action into some standardized form of technical rationality (Ellul, 1965). Instead, it aims to enrich descriptions by including things which have historically been omitted.

Such omissions, likely to persist in much of the dialogue around creativity, are not necessarily excluded from the central tenets of design.

Design, as I have argued in chapter four, differs from creativity in that its central tenets are built around the search for new forms and their 'good fit' with the environment (Alexander, 1964). It is therefore possible, in my view, to consider what Gibson Burrell (2013) describes as a "will to form", provided we do not begin with the *a priori* distinction that the creative individual bears sole authorship over the creative outcome. As the image of Daedalus in his workshop serves to remind us, the technical intrigues of the material world are not to be discarded too easily, and must be given due consideration, even where they appear to infringe traditionally human activities. Support for this view can also be found in the other theorists discussed in chapter five, particularly that of Herbert Simon and Donald Schön, who in their own way position design as fundamentally engaged with the technical environment. However, whilst both attend to this wider environment in their views of the function of the search (Simon) or the "conversation with materials" of the architect (Schön, 1991), both still retain the privileged position of the rational or creative individual. Contrastingly, attempts to move beyond this point of view (Suchman, 2005; Gherardi and Perrotta, 2013; Introna, 2013), insist that human actions such as design must be understood in terms of the different technical relations they connect together in practice. As such, the technical objects which enable design practices cannot be treated as mere placeholders (Latour, 2002), yet nor do they amount to a diminishment of humanity. Instead, their inclusion presents a more complex world in which the path to production is no longer straightforward, and subject to the necessary detours in the world of techniques and technical objects. Within these

detours, there are opportunities open to both the ingenuity of human operation and the indeterminacy of the materials being made use of, forming a world in which humanity is 'equipped' rather than displaced by technical objects (Thévenot, 2002) . Therefore, rather than any negative connotations which may be drawn in comparison with straightforward accounts that privilege the creative individual, following the detours of production points to a distributed picture of the real difficulties faced by the design process when creating something new, and also how different agencies are involved when attempting to do so (Miettinen, 2006).

In the Atlas and Helios studies, it became clear that when facing the trials of designing in a world of different agencies, designers adopted certain practices and ways of working, which draw attention to the different aspects of technique which I highlighted in chapter two. I also suggest these techniques of design may be extended beyond their current orientations to inform other areas of organizational life, of which there always exists a technical element. As a contribution to process organization studies, this guiding concept seeks both to increase interest in design perspectives, and avoid also avoid the risk of adopting its terminology in a faddish or superficial manner. In the techniques of design thinking, structured improvisation and prototyping, there lies an implicit recognition of the variability of materials, the crossovers and capacities presented by different agencies, and the complexities involved in trying to draw together these different forces to address problems presented by the environment. Via the dimensions of technique, I have aimed to show in greater detail how these different aspects are recognised and ordered (Harris, 2005), but it is the ways in which they are brought to bear on human and

organizational concerns which makes a dialogue with design relevant to process organization studies.

From its origins as a science of the artificial, design has continually held a concern for the place and influence of human action within the surrounding environment, which has developed into a field which is ready to tackle the political and ethical dimensions of creative production (Manzini and Cullars, 1992; Madge, 1997). As the variety of examples offered by the Atlas and Helios designers shows, the techniques themselves are not limited to industrial or computing processes, but are involved in various activities, from graphic design (p.59-60) to laser cutting (p.52) to developing training manuals (p.166-171). In place of a universal trait or capacity for creativity it may be more appropriate to argue for a desire to design (Burrell, 2013). This desire to design takes its form not as a psychological construct but as matter of concern (Latour, 2004), a question which must be asked or a desire to follow a specific task to its conclusion. Challenges are therefore raised on how process studies can assist organizational activity. What sort of designs do we wish to make real? The answer, depending on the context, and the unique sets of actors involved will vary, however it will necessarily involve technique. An understanding of technique, specifically applied to those commonly utilised in the process of design, may then offer a more engaged way of thinking about the different features which influence a composition of different outcomes. Some of these areas have been touched upon in works which have previously utilised the language of design to examine how new systems can be developed (Boland, Tenkasi and Te'eni, 1994; Garud, Jain and Tuertscher, 2008). I believe however, that this research can be extended much further. As studies exploring the effects of different agencies within the design literature have shown

(Ratto, 2011; Storni, 2012), there is room to consider the different ways in which agencies alter and influence the paths of production. In addition to what I have already described through the dimensions of technique, design may also consider the role of values and different symbolic regimes within the process of production (Thévenot, 2001, 2002). Without allowing such regimes to overshadow the technical influence of different actors (it is important that techniques and technical objects are understood beyond their symbolic value to humans) they can be considered in conjunction with others.

The Dynamics of Invention

In the above sections, I have outlined the three guiding concepts, which, taken together, form the dynamics of invention: the becoming-technical of organization, the inversions of novelty and the trials of design. How then, do they work together to act as a rough guide for process studies of organization, to describe the ways technique contributes toward creative practice? I have chosen the word dynamics to indicate a range of movement (highs and lows, fast and slow, displaced and relocated, all driven forward by the interactions between different technical forces), to reflect the processual nature of the concepts developed. In resistance to the current organizational emphasis on creativity as a desirable, individual capacity for producing successful ideas, I have chosen the term invention, with the aim of providing a counterpoint to this current trend (Jeanes, 2006; Styhre, 2006; Osborne, 2003; Pope 2009; Rehn and De Cock, 2009). Invention, as opposed to creativity, suggests both a process of creation by technical means, and also one which is not

predicated on a ‘creative’ idea intuited before its implementation or material realisation. In general terms, the concept of invention is preferable to creativity in that it does not carry the same connotations of individuals pitting themselves against the material world, nor the sense of a moral imperative to do so (Osborne, 2003). As Osborne also argues, “more often than not the very idea of creativity is just a component in a wider assemblage” (2003, p.52) of cultural norms, economic doctrines, industry standards and inherited knowledge, all driven towards the constantly production new things under the auspices of ‘progress’ (Thrift, 2006). In making this wider assemblage clear, these three threads or guiding concepts provide insight into the technical process of creation which I have argued is best captured by the term invention. Within these three guiding concepts, there are of course a number of different connections to be found within the “fragmentary whole” (Deleuze and Guattari, 1994, p.16) which form the inner construction of any concept,[12] built up of differing pieces. In the processes of becoming-technical I have identified how techniques, coupled with a process worldview point to a flux of different technical arrangements, ordering, assembling and dissembling different agencies in the process of production. Such a process is a natural candidate for considering how the emergence of novelty occurs in organizations, pulling attention away from the individual towards the creative advance made possible by changing relations between humans and technical objects. Comparatively, the process of becoming technical also enriches our understanding of the trials of design, exploring how particular techniques such as prototyping or structured improvisation can help us find our footing, if only temporarily, to combine material and symbolic resources within technical activity Carlsen, Clegg and Gjersvik, 2012. These relations also help solve

issues raised by the areas when considered in isolation. The temptation to place a creator back into the driving seat when discussing the emergence of novelty is tempered by the morphic, Daedalian figure of the designer described in the challenge of design, serving as a step beyond the critiques which have been levelled against the organizational creativity literature.

Whilst there are clear connections between these different threads which I have suggested can guide research through the labyrinthine paths of creative production, analysis should not be limited to them. As I proposed at the beginning of the chapter, theory should aspire to be paragrammatic, a "shifting stock of ideas, routines, images and ingredients which invite improvisation and elaboration, rather than copying or adherence" (Gabriel, 2002, p.134). In this spirit it is worth highlighting that ideas of novelty, technique, becoming, design and so on have been deployed in different fields and can be connected to other different components. As Deleuze and Guattari argue, "there are usually bits and components that come from other concepts, which corresponded to other problems and presupposed other planes. This is inevitable because each concept carries a new cutting-out, takes on new contours, and must be reactivated or recut" (1994, p.18). As a contribution to knowledge within process studies of organization I have been critical of the exclusion of many of these concepts from mainstream organizational theories (who prefer perhaps to construct their theories with altogether different resources) providing my own "cutting out" and subsequent reintroduction of components (notably techniques and technical objects) which I feel have been too readily omitted from discussions of creativity. Whilst I have positioned my views on technique against those found in the organizational creativity literature – opposing the figure of Daedalus against the

creative individual - there is much to be gained from examining their different uses in further detail. As Alexander Styhre (2002) has shown, exploring the generative properties of the AND… (Deleuze and Guattari, 2004) can be productively put to use in studies of organization, examining how a particular issue or set of theoretical propositions (in Styhre's case the concept of Human Resource Management) can be better understood in relation to its conjunctions with other concepts and components.

Though such connections are important, the dynamics of invention, with its constituent parts all taken together, does, I argue, provide a rough guide to how the dimensions of technique, coupled with the broader insights of a process worldview, answers the question of how technique can be understood as contributing toward creative practice. Just as the dynamics of invention forms a "fragmentary whole" (Deleuze and Guattari, 1994, p.16) allowing analysis to proceed on the basis of its internal components, it may also be contrasted against similar modes of understanding which draw analysis in different directions. My particular focus, via technique, has been the technical nature of organizational life. At the edges of this perspective, other ways (or modes) of analysing existence can be found. The technical concepts here may for example, lead into explorations of the biological or ecological aspects of organization, or, starting with a stronger influence on the symbolic nature of everyday activity, examine the cultural dimension. These concepts need not be positioned against those developed here, as they may simply represent different modes of existence. The particular mode of existence I have focused upon – the technical mode of existence, has been developed and expanded via process theories of organization to provide a dynamics of invention.

Conclusion

In this chapter, I have sought to draw together the different questions emerging from this study by developing the dynamics of invention, which highlights the possible contributions a theory of technique can make to process organization studies. Taking inspiration from a process worldview, I have presented a rough guide which aims to both consolidate what has been developed previously and answer the question of how technique contributes toward creative practice. The first guiding concept, becoming-technical in organizations refers to the implications of the dimensions of technique presented in chapter three. As suggested previously, the purpose of these dimensions is to highlight the technical nature of organizational life as found through the proliferation and utilisation of technique, which in this chapter I describe as part of a wider process of becoming-technical to capture how techniques can contribute to the emergence of new organizational forms and practices in a changing technical environment. Building on this process of becoming-technical, the second guiding concept considers how the dimensions of technique leads to an alternative understanding of novelty. Rather than a process of attributing novelty to particular outcomes, techniques point to a world in which novelty is understood as continuously emerging from the different technical associations and substitutions which occur in the production of new things. The second dynamic of invention therefore provides an account of the relationship between technique and the inversions of novelty. The final guiding concept, the trials of design asks how, in relation to these processes of becoming-technical and the continuous inversions of novelty, organizational actors can design well for the future. Taken together, these

three concepts detail how the dimensions of technique - coupled with insights from process organization studies- reform the image of creative practice into a technically engaged process which, in light of the broader field, I feel is better described as an inventive process.

In the next chapter, I draw this study to a close by considering its contributions to knowledge and limitations, as well as providing directions for future research.

7. DAEDALION

Introduction

At the outset of this thesis, I presented the image of Daedalus in his workshop, and also noted the term given to the outcome of his machinations: *Daedalion*. A *Daedalion*, Latour notes, is "something curved, veering from the straight line, artful but fake, beautiful and contrived" (Latour, 1994a, p.29). In this chapter, I examine the outcomes of this project –this *Daedalion*– and the different conceptual tools and scattered threads which I have attempted to coax into obliging forms along the way. The chapter begins with a summary of the arguments developed: the need to consider technique from a process perspective, to critically reflect on our understanding of creativity, to engage more effectively with the resources of design, and how these insights combine to form the dynamics of invention, addressing how technique contributes toward creative practice.

Having reviewed these areas, I then turn to the contributions this study makes to the field of process organization studies. In particular, I highlight the benefits of exploring technique, the value of drawing on the other fields to help process researchers engage with the technicity of organizational life (Cooper, 1998), and the opportunities these two elements hold for further consideration of creativity in organizations. Having discussed the contributions of this study, the chapter then accounts for its limitations. In particular, I address some of the conceptual arguments which may be raised against the approach I have taken, and my own view of its

overall strength. Building on this, I suggest a number of different directions future work in the field of organization studies could explore. Finally, I conclude this chapter with some closing thoughts on the relevance of the approach, the knowledge generated, and what it means to account for the roles of technique and creative practice in organizational life.

Summary of Argument

To restate the central aim of the study: this thesis has asked how technique can be understood as contributing toward creative practice, and has sought to provide answers to this question by drawing on a process perspective to uncover the hidden nature of technique. Whilst to date, the study of technique (*qua* technique) has garnered little interest within organization studies, it is nevertheless an important area of inquiry, particularly in relation to broader themes located found within the disciplines of anthropology, philosophy and sociology. I have argued that process organization studies (Hernes and Maitlis, 2010), with its emphasis on change, movement and becoming, offered the appropriate worldview and some important resources from which the study of technique in organizations could begin.

Having considered existing process approaches to examining technical activity in chapter three, I have developed a process reading of technique, composed of three dimensions. The first dimension highlights the different agencies present in the dynamic relations formed between humans and technical objects in the process of production. The second dimension emphasises the necessity of these relations for the durability of collective action, and the processes of association and substitution by which they are brought together and taken apart. The third dimension draws attention

to the artifice of technical production, exposing the *polymetis* involved in allying of different forces to a particular cause.

The recognition of technique led to a critical appraisal of the field of organizational creativity, which has often undermined the technical processes of creating in favour of an analysis of idea generation by creative individuals. Tracing the roots of this disjunction to the classical degradation of the craftsman's practical arts, I have argued that the study of creativity has historically undermined both technical objects and the attendant *tekhne* of production, instead emphasising thought and reflection. This disjunction results in difficulties for the present study of organizational creativity, which must account for (and in some cases rely upon) technical outputs as both the means and ends of creative action, without a clear understanding of how they are related to the process itself. Such difficulties have been noted by process studies of creativity, and this thesis aims to contribute to this ongoing discussion. In doing so, I have developed three areas of critique. First, the absence of technical objects from studies of organizational creativity, also noted by process theorists, which I have suggested could be rectified through an examination of the different agencies found within the creative process. Second, the use of the creative product as an indicator for creativity. I have argued that by waiting for a product to be both finished and retrospectively deemed creative, organizational studies of creativity lose much of the impetus for describing how creativity emerges within production. Following the work of Tim Ingold (2000, 2014; Ingold and Hallam, 2007), I have suggested that constructing theory in this manner results in a backwards reading of creativity, which unwittingly entrenches the view that the creator is the sole author of creative products or outcomes. Third, I have identified the attribution of novelty as a

key element which needs to be rethought if techniques and technical activity are to be incorporated within studies of organizational creativity. Taking inspiration from process studies utilising an emergent vision of novelty (Chia and King, 1998; Styhre, 2006), I have sought to show through a consideration of reproduction and replication that within production, novelty is far from a clear-cut distinction easily determined by observers or practitioners.

Having clarified the limitations within the organizational creativity literature, I then argued that resources for alternative understanding of creative production could be found in the theory and practice of design. Through an appreciation of the form and content of its own processes and outputs, theories of design are not wholly dependent on the image of an individual as the sole author of creative outcomes. Instead, theories of design offer the means to consider the creative process in terms of how humans, machines, materials and ideas come together. I reviewed three areas of the design literature, focusing on readings of design as a science, readings drawing on process perspectives (notably the American pragmatist tradition) and finally studies of design in relation to the dimensions of technique. In order to explore the potential this final perspective held for understanding the generation of new forms, I examined three design techniques commonly utilised within the two organizations, namely design thinking, prototyping and structured improvisation. I began with design thinking, which, rather than an abstract contemplation of form suggested something closer to an engaged mode of thinking in the face of the environment and the design problem at hand. Next, I examined the techniques of prototyping and its relevance to design. I argued that prototyping highlights the instability of ideas and intentions, a characteristic which also acts as a source of flexibility. Through the process of

prototyping, ideas and intentions are brought to bear against the properties made available by the technical means of their realisation. Finally, I have examined the techniques of structured improvisation. These techniques aid the development and decision-making process for generating new ideas by assisting their transfer. An examination of the technical means through which this is achieved exposes the different temporal characteristics of communication and the different technical objects utilised in doing so.

Drawing these arguments together to address the research question, and as a contribution to process organization studies, I presented the dynamics of invention, which seek to describe the continuously emerging, technically engaged understanding of creative production which this study advocates. The dynamics of invention are presented in relation to three guiding concepts which will help orientate further study. The first guiding concept, the becoming-technical of organization, refers to the implications of the dimensions of technique presented in chapter three. As suggested previously, the purpose of these dimensions is to highlight the technical nature of organizational life, which in this chapter I describe as part of a wider process of becoming-technical to capture how techniques can contribute to the emergence of new organizational forms and practices in a changing technical environment. Building on this process of becoming –technical, the second guiding concept considers how the dimensions of technique leads to a processual understanding of how novelty emerges. Rather than a process of attributing novelty to particular outcomes, the inversions of novelty points to a world in which novelty is understood as continuously emerging from the different technical associations and substitutions which occur in the production of new things. The final guiding

concept, the trials of design asks how, in relation to these processes of becoming-technical and the continuous emergence of novelty, organizational actors can design well for the future. Taken together, these concepts detail how the dimensions of technique - coupled with insights from process organization studies- offer a contribution to knowledge in the form of a critical and developmental engagement with understanding creative practice in organizations.

Contributions to Process Organization Studies

This study offers four contributions to the field of process organization studies: the explicit recognition of technique as grounds for inquiry, the extension of a processual account of technical activity, the critical account of organizational creativity, and the proposal of a dynamics of invention as an alternative.

The first contribution of this study is the resources it makes available for the study of technique in organizations. As I have suggested in chapter one, the grounds for overlooking technique as a conceptual tool are open to criticism. Addressing this, the dimensions of technique presented in chapter three provide the means to explore different techniques without ossifying them into fixed categories. Studying the role of technique, however, extends well beyond this study, and should be recognised as an important task regardless of whether one agrees or disagrees with the specific formation of technique presented here. Similarly, process organization studies can only benefit from disaggregating the different elements which fall under the rubric of 'technology' and address each separately. In this study I have focused on technique,

however one could also examine in further depth the treatment of technical objects, the role of technics in society, and, if the term is to be used, the *techno-logics* which help guide thinking (Latour 1988b fn.1). Technology is a cumbersome term, and one which also reminds us of the power of words to render certain aspects of the world oblique (Marx, 2010). Disaggregating it will help organizational scholars find new ones.

The second contribution to process organization studies is the formulation of technique as three complimentary dimensions to further develop process accounts of technical activity. In constructing these dimensions, I have drawn upon concepts found within Latour's work (1994a, 2005b) and the philosophies of Gilbert Simondon (2017) and Gilles Deleuze & Felix Guattari (2004). Whilst these dimensions are aligned with many aspects of ANT, they also diverge from it at key points, which may benefit future scholarship. To be clear, I have critically considered the use of the symmetrical imagery often employed by ANT, and, to a certain extent, the use of the word actant.[1] I have also, following calls to keep the vibrant, anti-essentialist character of ANT alive (Mol, 2010), developed a model which is itself the hybrid product of the various different philosophical influences which inform it. These choices have been made to develop dimensions which can provide greater focus when examining the specific techniques and technical assemblages found within the processes of creative production. The result is a processual reading of technique that not only addresses the issues encountered in the Atlas and Helios studios, but also builds new connections within process scholarship. The dimensions of technique can therefore be viewed in correspondence with a number of works within process organization studies which have also sought to extend the resources

found within Actor-Network studies (Czaniawska, 2008; Orlikwoski, 2009; Cooren 2015) as well as the study of technology in general (Cooper, 1998; Stiegler, 1998).

The third contribution of this thesis has been to provide a sustained critique of the social psychological paradigm of creativity research which pervades organizational studies of the topic. Building on important contributions developed by process scholars and theorists advocating an image of social creativity, I have sought to highlight the internal contradictions within its primary source (Amabile, 1996). It is my hope that this action will spur on further critical reflection as to how organizational researchers can understand creativity and the creative process of production found in organizations. I have shown that Amabile's work, which itself attempted to resolve previous difficulties found within the psychological paradigm, also created its own set of limitations, which, having informed organizational scholarship for the last 20 years, are overdue some critical thought. Taking this opportunity, I have also highlighted aspects of creativity research which, as the discussion on the classical degradation of technique and the practical arts has shown, run much deeper than Amabile's work. On this point the psychological paradigm itself may not be prepared to accept the views described here, however there are some areas within that paradigm which are amenable to it (for example, works which emphasise the distributed nature of thought: see Glăveanu, 2014; Tanggaard, 2013; Miettinen, 2006 as well as process studies emphasising the emergence of novelty (Chia and King, 1998; Styhre, 2006; Hussenot and Missonier, 2016).

The fourth contribution of this thesis, in response to the research question, is a processual reworking of creative production as a technically engaged process from which new forms emerge, described as the dynamics of invention. In general terms,

the dynamics of invention aim to capture the aspects which have been left out of traditional creativity research. Providing a new avenue for research into creative practice, the dynamics of invention also extend works within process based studies which have examined both creativity and the role of technical objects (Cooper, 1998; Gherardi and Perotta, 2013; Pinch 2015) and process studies of design (Garud, Jain and Tuertscher, 2008; Coyne, 2005). The three guiding concepts described in the dynamics of invention each offer a contribution to the field of process based studies. The becoming-technical of organization explores how the process of technical change begets creative development. The inversions of novelty explores how techniques support the conditions for new forms to develop, and the trials of design offer a contribution in explicitly theorizing how humans can go about the process of production in a world of different competing agencies. Whilst I recognise this work is only a preliminary step, I do believe it sets out the agenda for future research in this direction, inviting further reflection on the nature and operations of form, matter, materials, machines, ideas and their tangled pathways.

Limitations and Directions for Future Research

Having constructed this study and spoken for its contributions, it is also proper that I address its limitations. I have identified three areas which invite critical discussion: The potential for discord, the risk of reinstating Latour's modernist divide and the need for further dialogue with other scholarship relevant to the study. These limitations also form opportunities for future research: the need to further consider the temporal, political and ethical dimensions of creative production, and the potential for further empirical work on the nature of technique and invention.

The first limitation of this thesis is the possibility of discord between the different concepts I have brought together in this thesis. Whilst I do not think the social sciences should "add fresh ruins to fields of ruins" (Latour, 2004, p.224), endlessly deconstructing and finding negative points of disagreement, it is equally important to recognise where exactly such differences and disagreements lie. I shall therefore consider briefly the possibility for discord between the different works I have drawn together. First, the work of Gilbert Simondon, which I consider to be an important precursor and connecting thread between Deleuze & Guattari and Latour, must also be appreciated as a theory which is of its time. Comparisons between Latour and Deleuze are perhaps easier to make, given Latour's early interest in Deleuze's work (Schmidgen, 2013), however it is equally important to recognise a) that Latour often describes ANT as an orphan theory b) references to Deleuze & Guattari are sparing, and not always complimentary. These authors, as I have noted, do all share an interest in how techniques and technical objects are enfolded into everyday life. To reiterate, my primary aim was to describe technique, and in this regard I believe all authors to be indebted to both the post war theories of technology shaped by systems theory, cybernetics, and the French anthropological tradition. There is therefore a shared influence which process organization studies could benefit from exploring further.

The second limitation, which must be addressed by all works which have engage critically with ANT's resources, is the risk of unwittingly returning to the "great divide" (Latour, 1993) which places subjects on one hand and objects on the other. This is avoided in Actor-network studies by utilising a unique set of terms which do not distinguish between the types of actor involved (such as problemitization,

enrolment, interessment, mobilisation, see Callon, 1984; Akrich, Callon and Latour, 2002). By using a different set of terms, and attempting to deal with issues such as creativity and design, this study may run the risk of reinstating the divisions between objects and subjects which I have also implied should not be enforced. Like Latour's moderns, this study may also be accused of "using both dimensions in practice" but failing to be "explicit about the relation between the two sets of practices" (1993, p.51). Though keen to avoid this pitfall, I am also mindful of the totalising effects a rigid adherence to ANT's program can have (Latour, 2013). In particular, the erasure of differences between different types of agencies as an unwanted consequence of using the same descriptors to describe movements between them.[2] In my defence, I have opted to engage in a trade-off between the purity of Latour's vision[3] and its widely recognised limitations (Czarniawska, 2008). I have also made reference to both Simondon's concept of concretization (1992), and Hjorth's (2013) Deleuzian concept of subjectification to show how my proposals sit alongside both.

The final limitation is the need for further dialogue with related fields of study. As I have noted in chapter three (see also fn.6, p.286) scholarship on the areas of craft (Sennet, 2008; Taylor, 2012) and aesthetics (Strati, 1999; Linstead and Höpfl, 2000) are two areas with much to add to a discussion of technique. I have, for the purpose of this study, chosen not to deal with these areas to maintain clarity and focus on technique and the research question. Future scholarship may benefit from exploring these connections further.

As these limitations suggest, this study offers both answers and some important questions, and therefore also opens up some exciting prospects for future research. Firstly, future research can extend the connections made in this study, or develop

new ones (Styhre, 2002). As Annemarie Mol notes, ANT is a "wild and creative tradition" (2010, p.254), which invites the possibility for new thinking and should not be treated as a dogma for organizational researchers. The issues developed in this study may therefore lead to further inquiry into the nature of *metis* and its relevance to technical objects (Detienne and Vernant, 1978; Chia and Holt, 2009; MacKay, Zundel and Alkirwi, 2014), the role of repetition and reproduction in strategies for generating new forms (Styhre, 2006) or the relevance of prototyping to a variety of activities beyond its typical use within design-led organizations. The dynamics of invention may also be utilised to further consider the ways in which creative practice can be understood beyond the psychological paradigm of successful idea generation.

Secondly, future research can address the ethical and political consequences of recognising role of technique and the interrelation of human and non-human agencies (Introna, 2013). The consequences of such interrelations have been raised in process studies considering the impact of technical objects on the human body (Cooper, 2007) and the possibility of an artificial morality (Sotto, 1998). Interestingly, both the political and ethical implications of ANT's propositions have been subject to criticism (Winner, 1993; De Vries, 2007; Krarup and Blok, 2011). However as recent work has shown, ANT may provide an alternative means for how ethical and political issues are approached (Latour, 2002; 2005a), making a strong case for why techniques and technical objects should not be excluded from discourses surrounding political or ethical issues. Once again, the issue of symmetry appears to be a point of contention for both political and ethical perspectives, adding further value to the theory of technique presented in this study. Similarly, studies of organizational creativity are predominantly focused on new and useful outcomes. The political and

ethical relativity of this position has not gone unnoticed (Mainemelis, 2010), and the challenge of design, described within the dynamics of invention, is well placed to consider how these dimensions are influence production.

Thirdly, this study also identifies the variety of different locations research can undertake studies into organizational issues. The design-led Atlas and Helios studios provided a useful location to examine issues which can be difficult to expose due the tendency for technical issues to become black boxed in other settings. As I have argued in chapter three, work within these studios has offered opportunities to examine different agencies in a manner which is not always straightforward with finished items, which, by their nature, are the outcome of different competing forces reined under control, and thus may pass unnoticed (Flusser, 1999; Latour, 1987; Anusas and Ingold, 2013). The unfinished and contested nature of production presents an important location for studying the process of organizing and may also hold value for future studies. Lessons from diverse areas may also help inform work in different contexts, which, I argue, are still subject to the same issues, though they may not be immediately visible.

Concluding Remarks

This study has sought to convey the wealth of insights to be drawn from investigation into the world of technique and its implications for the process of organizing. Whether simple or complex, involving many or few agencies, detached or tied up in webs of interactions, they necessarily contribute to the production and maintenance of organizational life. Technique also forms an important part of the process of invention, which is only ever partly the domain of the creative individual,

and in this regard organization studies may be better served by the resources found within theories of design. Recognition of technique, rather than diminishing human activity, instead serves to enrich our understanding of what it means to act and the technical ways we go about doing so. Drawing upon a process worldview, techniques also point to the changing, heterogeneous activities which characterise the everyday acts of organizing, and may help future research to better understand their operations. Looking forward, I have outlined a number of different areas future research can explore, building both upon the possibilities and limitations presented by this study. Likewise, this study has also sought to look backwards, as many of the ideas presented here have their origin in diverse fields of inquiry with their own unique histories. The problems such fields of inquiry sought to address however, still remain. In a world in which organizations are increasingly taking advantage of technical advancement and the proliferation of technical objects, further reflection on the ways humans and non-humans fit together within the sphere of production can only benefit from a diversity of viewpoints. Finally, an appreciation of technique will, I hope, lead us to a better understanding of the archetypal figure caught up amongst the manoeuvres and machinations of technical activity. To understand the figure of Daedalus in his workshop is to understand the cunning artifice and metis of the technical fix, and to understand the *Daedalia* which continue to populate and propagate our increasingly technical lives, shaping and being shaped by us.

NOTES

PROLOGUE

1. Bruno Latour, 1999b, p.192.

2. *Daedalia* are the plural form of *Daedalion*, defined by Latour as "something curved, veering from the straight line, artful but fake, beautiful and contrived" (1994a, p.29)

3. As Detienne and Vernant note, *Metis* is "characterised precisely by the way it operates by continuously oscillating between two opposite poles. It turns into their contraries objects that are not yet defined as stable, circumscribed, mutually exclusive concepts but which appear as Powers in a situation of confrontation and which, depending on the outcome of the combat in which they are engaged, find themselves now in one position, as victors, and now in the opposite one, as vanquished." (1978, p.5)

CHAPTER ONE: IN DAEDALUS' WORKSHOP

1. A similar degree of interpretative value is also found in definitions of practice, which can refer to anything from vegetarianism, acupuncture or cavalry charges (Barnes, 2001), encompassing in its fullest expression all types of social and political action (Ortner, 1984).

2. See L. Marx, 2010, p.576. The phrase "phantom objectivity" utilised by Leo Marx is borrowed from the philosopher Georg Lukacs to describe "an autonomy that seems so strictly rational and all-embracing as to conceal every trace of its fundamental nature: the relation between people" (as cited in L. Marx, 2010, p.576) and closely linked to Karl Marx's concept of reification.

3. Bergson was opposed to the doctrines of both *radical mechanism*. in which species adapt to external forces based on a set of universal, unchanging laws, and *radical finalism*, a form of inverted mechanism in which a species seeks to realise its true prescribed form through a series of adaptations.

4. Bergson drew much from Darwin, though differed on the randomness of variation, as articulated in his 'general idea of the evolutionary process' (1944, p.95-9).

CHAPTER TWO: INSIDE THE WORKSHOPS

1. Rheinberger also provides a traditional description of experiments as “singular instances designed and performed in order to corroborate or to refute theories (1992, p.309).

2. Styhre and Sundgren argue that “experimentation is inextricably entangled with novelty, with the production of the new, the innovative, even the radical.” (2005b, p56-7)

3. It is important to understand that for Barad, an apparatus is an “open ended practice” rather than an object which simply measures things: “Apparatuses are not inscription devices, scientific instruments set in place before the action happens…They are neither neutral probes of the natural world nor structures that deterministically impose some particular outcome” (p.816)

4. “The agential cut enacts a local causal structure among “components” of a phenomenon in the marking of the “measuring agencies” (“effect”) by the “measured object” (“cause”)” (p.815).

5. *Tâtonnement* refers to a process of trial and error.

6. The image of the Labyrinth with respect to knowledge generation (and its assumed correspondence to reality) is also invoked by Wood (2002).

7. Mol (1999) notes that the designation of a reality which is multiple (multiplicity) can be distinguished from two previously related positions which argued for a *plurality* of viewpoints within research. The first position is *Perspectivalism*, in which the world is viewed from different individual standpoints, with the difference emerging from the viewpoints and not the world itself. The second is *Constructionism*, which considered the ways in which knowledge is historically constructed.

8. This is not to say that in either case creativity does not happen: one could easily imagine a situation where one must act quickly and beyond protocol to deal with dangerous waste chemicals or develop an innovative solution to a financial problem. The difficulty with such contexts is that a lack of recognition or discourse around creative practice can make it difficult to gather explicit insight from those involved.

9. My own view is that in its own wild and creative tradition, it is no surprise that authors such as Latour and Law often offer the most interesting perspectives, by deviating significantly from what might be considered the core tenets of ANT, particularly with regard to method.

CHAPTER THREE: TECHNIQUE

1. A similar view of the unique nature of human intelligence was held by Karl Marx, who opined that: ‘what from the very first distinguishes the most incompetent architect from the best of bees, is that the architect has built a cell in his head before he constructs it in wax’ (As cited in Ingold, 2000, p. 340).

2. Mauss’ argument, which Ingold has interpreted as a “*disembodiment* of intelligence, acting as a separate force guiding bodily activity” (2011, p.57), is, I believe, better understood as an early effort to consider how natural life contains technique, or is already technical (see also Crossley, 2007). This can be observed by Mauss’ aversion to the word ‘instrument’, and his description of the body being “a natural technical object” (1973, p75).

3. As Leroi-Gourhan himself wrote, “the emergence of tools as a species characteristic marks the frontier between animal and human, initiating a long transitional period during which sociology slowly took over from zoology” (1993, p.90). Humanity therefore “outgrows its bodily envelope, but continues to grow *into* the artificial, technical and social prostheses that extend, amplify and eventually replace its biophysical capacities” (Ingold, 1999, p.424).

4. Deleuze and Guattari define assemblages as “constellations of singularities and traits deduced from the flow-selected, organized, stratified” (2004, p.448).

5. As Simondon writes, “the technicity of the object is thus more than a quality of its use; it is that which, within it, adds itself to a first determination given by the relation between form and matter; it acts as an intermediary between form and matter…Technicity is the degree of the objects concretization” (2017, p.72)

6. Whilst the terms of craft and skill are naturally related to technique, it will be instructive to consider why we may wish to avoid the use of both. In line with Bittner’s (1983) argument in chapter one, I am keen to avoid the term craft as a throw-back to pre-industrial modes of production. Though I do not question the sense in which authors such as Sennett (2008) and Taylor (2012) utilize the term, I agree with Simondon (2012), who argued that "trying to return to directly artisanal modes of production is an illusion". It will be necessary instead to seek to incorporate the ‘affective modalities’ of craft into a better image of modern technology. With regard to skill, it is important to acknowledge that some key works in the domains of aesthetics (Strati, 1999) and anthropology (Ingold, 2000; 2008) bear much similarity to my articulation of technique. My only issue is the broader tendency within organization studies to treat skill as a cognitive function (Chell, 2013), hence why I have chosen not to pursue the term further.

7. On this point I am in agreement with Bernard Stiegler’s view that “all human action has something to do with *tekhne*, is after a fashion, *tekhne*. It is no less the case that in the totality of human action “techniques” are singled out” (1998, p.94). Stiegler points to dancing and elegance, which both produce a spectacle and an outward communication to the intended audience, without the use of a technical object. It can also be argued, as

Marcel Mauss proposed, that the body itself is "man's most natural technical object" (1973, p.75).

8. Whilst Latour does opt for a language which aims not to change registers when describing different agencies, the author is also clear that the idea of symmetry was never intended to make them *equivalent*: "ANT is not, I repeat is not, the establishment of some absurd symmetry between humans and non-humans. To be symmetric for us, simply means *not* to impose a priori some spurious *asymmetry* among human intentional action and a material world of causal relations " (2005b, p.76). The purpose of the geometric metaphor of symmetry, as the quotation suggests, is to dissolve the prefabricated division between subjects and objects. The metaphor however, has often been misunderstood, leading to a position where objects and subjects are held as distinct and suspended in symmetrical division. This error, which renders subjects and object as eqivalent, is not the same as describing a world in which different agencies can be treated in equal *terms*- that is, in terms of their shared influence and effects. It is in this way that Latour's project bears much similarity to the work of Deleuze and Guattari.

9. In Ellul's view, the character of technique heads towards rationalisation, a lessening of humanity required in order for it to operate smoothly with the automation of modern technology. However, as Simondon had noted previously, this tendency towards automation is not always a given or even desirable aspect of technical development. In contrast to Ellul's conclusions, Simondon (2017) argued that the automatism prevalent in modern technology represented a low form of technicality, more consistent with economic demands than technical ones (see also Dufrenne, 1964).

10. As Latour writes in irreductions: "There are only trials of strength, of weakness. Or more simply, there are only trials. This is my point of departure: a verb, "to try" (1988, p158)

11. It is also worth noting that Harman's account of Latour's work relies heavily on his own unique interpretation of Latour's (1988) irreductions, which Harman also states may not be wholly representative of Latour's thinking.

12. On the subject of multiple durations Law and Mol point to Michel Serres, who wrote that "[o]bjects are flames frozen by different times. My body is a flame slightly slower than the curtain which consumes those logs. Others, stones, are still slower while yet others are so much faster – suns. A thousand times make their edges beat (Serres, 1980, translated by Law and Mol, 2001, p.6).

CHAPTER FOUR: CREATIVITY

1. Such potential for indeterminacy is noted by Bergson, who argues that whilst creations are always possible in the negative sense "that there was no insurmountable barrier to its realization", creations do not then possess the quality of "being possible before being real" (1992, p.21).

2. Recalling the earlier distinction between the design and execution, Protevi notes the architect is "blind to such traits and despises 'surrender' to matter; he only sees and commands" (2001, p.8).

3. Amabile does not develop this point in any great detail, however, in referencing Bruner does point towards his description of creativity as being connected to a form of "effective surprise" (1979, p18), suggesting that the shock of the new is something all people experience.

4. The distinction between designing and making is once again the product of the degradation of *tekhne* noted at the beginning of the chapter. This distinction is however, ideological, and as Protevi (2001) and Sennett (2008) have argued, must be understood in the political context of its origins.

5. See Simonton's (1980) objective approach to measuring originality in musical compositions.

6. Alongside the unique place and time of the original, Benjamin argues that the aura of the work of art emerges in direct correspondence to its tradition: "*The 'one-of-a-kind' value of the 'genuine' work of art has its underpinnings in the ritual in which it had its original, initial utility value*" (2008, p.11).

7. Deleuze notes the central issue with judgement in respect of novelty, arguing that "judgement prevents the emergence of any new mode of existence" and asks the critical question "what expert judgement, in art, could ever bear on the work to come?" (1998, p.135)

CHAPTER FIVE: DESIGN

1. It should be noted that many of the pragmatist and process inspired studies of design principally operate on the epistemological level, leaving ontological concerns largely untouched. This is likely due to the scientific legacy of Simon, and its continued application to computational processes (Suchman, 2007).

2. A better formulation would of course be to do away with the idea of a pendulum swinging between these two poles all together, replacing it with a third term which is not a halfway house between subject and object but a separate concept beginning from multiplicity.

1. Deleuze and Guattari (2004) explore a number of paths including (but not limited to) becoming-animal, becoming-Other, becoming-imperceptible…

2. "Just as the Phrygian river Maeánder sports and plays/ in his cunning stream with ebb and flow of his teasing course…/ So Daedalus' warren of passages/ wandered this way and that. In such a treacherous maze/ its very designer could scarcely retrace his steps to the entrance" (Ovid, *Metamorphoses* (8.161-7), Trans. Raeburn, 2004, p.302)

3. "What is real is Becoming itself, the block of becoming, not the supposedly fixed terms through which that which becomes passes" (Deleuze and Guattari, 2004, p.262)

4. Becoming is also intrinsically linked to temporality (Tsoukas and Chia, 2002; Hernes, 2014a), which I have noted in chapter three has been opened to the question of multiple temporalities. Whilst there is clearly further work required to articulate how such temporalities are understood within the existing rubrics of process studies, it nevertheless remains an exciting line for future inquiry (Czarniawska, 2004).

5. In this respect my approach diverges slightly in focus from that of sociomateriality. Whilst this study shares many of the same tenets of sociomateriality, my concern is less to do with simply highlighting the *inseparability* of the social and the material and more to do with the ways they continuously alter and transform one other. A similar argument has recently been put forward by Jarzabkowski and Pinch (2013), who warn that much of the academic work on sociomateriality has fallen back into examining how human intentions are encoded into technical objects, rather than the mutual activities and processes in which they are engaged.

6. This zone is also described in the *machinic phylum* of Deleuze and Guattari (2004), and in Simondon's arguments for a *technical mentality*, which presupposes an ever-increasing coexistence between humans and technical objects.

7. Things become more difficult if different agencies are considered from a substantialist perspective, in which they are treated as fixed, endogenic, and different in kind to other agencies. As a result, a substantialist perspective may legitimately struggle to see how different agencies can be treated as symmetrical, but only because it affords so few opportunities to consider what occurs between them.

8. Recall that Johnston describes the deterritorializing effects of *machinic vision* as "a field of decoded perceptions that, whether or not produced by or issuing from these machines, assume their full intelligibility only in relation to them" (1999, p.27).

9. Latour's critique against Homo Faber is, I believe more likely a shorthand for the excesses of individual creativity than a direct comment on Bergson's use of the term. As Hannah Arendt noted, Bergson may have been responsible for the term entering circulation, however its meaning has likely altered over time. Indeed, as Guerlac (2015)

shows, Bergson himself was of a similar opinion of a spirit of invention out of control and taking the material world for granted. Described as an inordinately swollen body, "humanity suffers half crushed under the weight of the progress it has made" and demanding a new technical way of living which also attended to the spiritual (Bergson, 1935, p.1245, as cited in Guerlac, 2015)

10. Whilst Deleuze and Guattari are eager not reduce becoming to a wholly technical phenomenon (See Mullarkey (1997) for arguments against a cybernetic reading of Deleuze's philosophy), it is the primary concern of this study to describe technique, and 'technological lineages' certainly have their place in Deleuze and Guattari's philosophy (see for example Deleuze and Guattari, 2004, Plateau 12)

11. Beyond the very general sense that creativity is a psychological capacity for producing new ideas, and therefore a sort of untapped, unlimited resource to be utilised by organizations, I do not consider the extreme *ex nihilo* hypothesis to be particularly prevalent within organization studies. That being said, works such as Mainemelis (2001), which present creativity as an ecstatic realisation which occurs outside the individual's perception of time, are unhelpful in this regard.

12. Support for this view can be found in the fact that many radically novel/useful developments are not instantly recognised as such until much later. This can be due to the new approach being viewed as regressive (such as in modern artistic movements such as expressionism, which were initially deemed as artistically inferior to traditional realist approaches which did not share its alternative viewpoint on how the world should be represented) or out of sync with a particular agenda. Similarly, Manuel De Landa (2004) describes how materials science, now a key driver of new products, languished in relative obscurity due to its differences from the pure sciences.

13. For Deleuze and Guattari, concepts belong to the domain of philosophy, and are in turn considered in relation to other modes of thinking found in science (functives), and art (percepts). It is not my intention to position any of the concepts developed in this thesis alongside those dealt with by Deleuze and Guattari. I only suggest (after Chia, 1997) that as studies of organization involve forms of metaphysical inquiry, that the products of those inquiries, frameworks, concepts, and critical positions, may be treated in a similar manner.

CHAPTER 7: DAEDALION

1. Whilst I do not disagree with Latour's (1994a) description of the term and its uses, I find that in practice, to describe something/someone as an 'actant' tends to gloss over the shuffling and swapping of properties which are occurring underneath. In contrast, the term agency does not seem to have the same homogenising effect.

2. A possible solution to this issue, noted by Isabelle Stengers (2005), is to recognise the difference between a *mise en égalité* and a *mise en equivalence*. A principle of equlity

(*égalité)*, the author notes, is not the same as a princple which renders different forces equalivalent (*equivalence)*. In some interpretations, Latour's use of the word actant has been taken to have this effect, flattening the differences between agencies and making then equivalent/symmetrical.

3. As Ray Brassier notes in his critique of Latour's more radical positions, "It is instructive to note how many reductions must be carried out in order for [Latour's] irreductionism to get off the ground: reason, science, knowledge, truth—all must be eliminated." (2011, p.51).

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APPENDICES

Appendix 1: Participant information sheet & consent form template

Participant Information Sheet

Name of department: Strategy and Organisation
Title of the study: Unmarked space: Towards a theory of the creative process for innovative organisations

Introduction

Hello, my name is Rory Tracey; I am a post-graduate research student currently undertaking doctoral research at the University of Strathclyde. The aim of this document is to inform you of the nature, content and proposed method of the research in which I invite you to participate. Please consider all issues carefully before agreeing and do not hesitate to raise anything that you feel requires further explanation. My full contact details are as follows:

Rory Tracey
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What is the purpose of this investigation?
This research aims to provide organisations with a workable understanding of the creative process, as experienced in their day to day operations of design and production. My thesis is premised on the argument that, to date, much of the research on organisational creativity has been conducted backwards. By this, I mean that people wanting to know more about the creative process tend to study already successful new products or innovations in the marketplace. The problem with this is that it leaves the process of creating almost completely out of the picture! From a retrospective point of view, the creative process can seem vague or indeterminate, and is often treated as such.

However, organisations are constantly doing and making new things. Indeed, if an organisation is not producing new things or new ways of doing things, one may question if it is doing anything at all! Why then, do we have so little to say about what is going on? I believe there is an unhelpful division between how we talk about creativity and what we do when we make new things, a division caused (among other things) by looking at the process backwards.

To rectify this, I suggest that a more productive approach would be to work with the processes as they occur, tracking the design and production of a product to provide an insight into the creativity implicit in everyday activities.

Do you have to take part?

Participation is voluntary and you have the right to withdraw up two six weeks after the data has been collected.

What will you do in the project?
The proposed duration of the project is 3 months, during which I would track the creation of new products or processes undertaken by your organisation. Participatory observation will be the primary mode of inquiry, consisting of on-site observation, discussions with those involved in the project under study, attending meetings and participating in any other activities deemed useful or appropriate by your organisation. If consent is given, I will also collect images and documents related to the process. As a means of concluding the project, interviews will be conducted at the end of the proposed research period.

Why have you been invited to take part?
Your company has been highlighted as being engaged in creative design and manufacturing activities.

What are the potential risks to you in taking part?
No outstanding risks or hazards have been identified within the research design, and all data will be handled in the manner outlined below.

What happens to the information in the project?
Data will be collected via Dictaphone. All data will be pseudo-anonymised. Participants will not be referenced by name, but details of their occupation will be provided (e.g. Participant 1 is a product design engineer).All data will be stored digitally under a password protected file. Any images of participants at work will be edited to ensure anonymity.

The University of Strathclyde is registered with the Information Commissioner's Office who implements the Data Protection Act 1998. All personal data on participants will be processed in accordance with the provisions of the Data Protection Act 1998.

Thank you for reading this information – please ask any questions if you are unsure about what is written here.

What happens next?
If you are happy to take part, a consent form will be provided to confirm your approval. If you do not wish to be involved, thank you for your attention. All participants will receive an electronic copy of the research upon request and will be informed of any publication opportunity as a result of the project.

Researcher contact details:

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Chief Investigator details:
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Director of Research
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This investigation was granted ethical approval by the University of Strathclyde Ethics Committee.

If you have any questions/concerns, during or after the investigation, or wish to contact an independent person to whom any questions may be directed or further information may be sought from, please contact:

Secretary to the University Ethics Committee
Research & Knowledge Exchange Services
University of Strathclyde
Graham Hills Building
50 George Street
Glasgow
G1 1QE

Telephone: 0141 548 3707
Email: ethics@strath.ac.uk

Consent Form

Name of department: Strategy and Organisation
Title of the study: Unmarked space: Towards a theory of the creative process for innovative organisations

- I confirm that I have read and understood the information sheet for the above project and the researcher has answered any queries to my satisfaction.
- I understand that my participation is voluntary and that I am free to withdraw from the project at any time, without having to give a reason and without any consequences.
- I understand that I can withdraw my data from the study up to six weeks after the data collection process.
- I understand that any information recorded in the investigation will remain confidential and no information that identifies me will be made publicly available.
- I consent to being a participant in the project
- I consent to being audio recorded as part of the project Yes/ No
- I consent to images of me being taken as part of the project Yes/ No

In agreeing to participate in this investigation I am aware that I may be entitled to compensation for accidental bodily injury, including death or disease, arising out of the investigation without the need to prove fault. However, such compensation is subject to acceptance of the Conditions of Compensation, a copy of which is available on request. Yes/ No

(PRINT NAME)	
Signature of Participant:	Date: