A grammar of creative workplaces

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Abstract

This study proposes a *grammar of creative workplaces* which identifies and codifies those elements of the physical environment that are reported to actively stimulate and sustain creativity in the workplace. The grammar is explicit rather than metaphorical or taxonomic. It emerges from and is applied into workplaces, predominantly office environments. Three elements, *meaning*, *lexis,* and *syntax,* central to the structure of linguistic and non-linguistic grammars, are proposed as the grammar's method and as its content. Respondents in the research study identified the creative behaviours that stimulate and sustain their creativity, and the discrete physical elements that influence and support (and can hinder) those activities. It is suggested that those creative behaviours and the discrete elements of physical space are congruent with the three key grammatical elements.

The grammar addresses that gap in knowledge in the fields of architecture, design and psychology where the impact of the physical environment on people's creativity in the workplace is acknowledged, but is without mediating structures of theory or implementation.

The grammar is presented in two forms. Firstly as a detailed instrument for assessing a workplace's capacity to support user creativity, and secondly as the theoretical foundation of a generative grammar for the design of creativity-supporting workplaces. As an assessment instrument the grammar sets out in depth the *places* needed for users' creative behaviour, six meta-categories of workplace sensory *properties* reported to enhance user creativity, the *affordances* or materials and equipment needed to support creative behaviours, and the *behaviours* themselves that lead to creative outcomes.

In its generative form the grammar uses these identified elements of place, properties, affordances and behaviours in an IF→THEN configuration. Place, properties and affordances form the grammar's lexis, and behaviours is its syntax. This generative form creates the basis from which spaces with optimum creative potential can be designed.

The grammar in both its forms thus aims to inform and supplement existing good practice in which architects and designers use their experience or intuition to design for

optimal user creativity. In its assessment form it aims to empower workplace users to audit their own workplaces and identify changes they might make to increase creative potential.

Configurations of visual language encompass both patterns and grammars and this thesis draws on work done by, among many others, Alexander, Chomsky, Stiny, and Halliday in this field. Patterns and grammars exist across many disciplines to build structures of communication and analysis: this thesis positions its argument within three-dimensional physical space. Derived from the data through constructivist grounded theory, the emergent grammar is validated through the analysis of two workplaces, demonstrating its robust nature and its rootedness in practice.

This study, therefore, proposes an explicit grammar of creative workplaces that can inform the design and the evaluation of physical workplaces. The study further proposes that in its generative form the grammar could provide a foundation for testing the influence of physical space on creativity, beyond the reported impact examined here.

This work aims to contribute to the fields of Architecture, Design and Creativity Research, and to inform and inspire those who create, and those who use, workplaces.

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Acknowledgements

Any research project will be influenced by the conversations that surround it. I have been fortunate in the interdisciplinary discussions that have critiqued and informed my work. I wish to acknowledge the influence of particular people and ideas in those discussions.

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For Clara, Theo and Max

Chapter 1: Introduction

1.1 Context of the thesis

This thesis is situated in the context of commercial and public organisations that require their staff to be creative. Creative, that is, in the sense of everyday problem-solving and solution-seeking, addressing organisational issues of performance, process and production. At times the creativity studied is near the middle of the small-c to big-C continuum[1] (Amabile 1983/1996; Simonton 2005), but for most of the people and organisations in this study, creativity is a useful everyday tool.

This thesis is rooted in my professional practice as a specialist in organisational creativity. As an independent consultant I have worked with individuals, teams and departments in organisations as diverse as UK government departments, multinational manufacturing and engineering companies, advertising companies, whisky distilleries, education and Non-Governmental Organisations (NGO) over twenty years. The work that informs and contributes to this thesis was done between 1990 and 2002. My remit was to help staff in client organisations develop their skills in the everyday creativity, problem-solving and lateral thinking needed for performance improvement programmes such as 6 Sigma, Lean Thinking and Total Quality Management (TQM). The training focused mainly on small-c creativity, hence everyday problem-definition and problem-solving thinking. Occasionally participants would use the creative thinking tools to generate new ideas for products and processes, including for example a new way of dispensing bank notes from ATM machines that eliminated any possibility of the notes sticking; a rewritten production process which saved time, errors and money; and a large-scale consolidated parts handling method that prevented over- or under-ordering of materials but predominantly the ideas generated were more quotidian. It is from this professional practice that this study has developed, fuelled by my desire to more deeply examine the phenomenon of physical space's impact on creativity that I had been observing over the years.

An integral part of the training I delivered during the years 1990 - 2002 involved raising people's awareness of their moments of creative insight so that they might more consciously repeat them. Over the years the same patterns of creativity-spurring activities and their associated places emerged time and again. At the heart of this sat a

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[1] This concept is set out in detail in Chapter 2, Section 2.2, pages 10-11.

training exercise which asked the question "Where are you, and what are you doing, when you have a good idea?" The answers to this question were written on flipcharts and formed the basis for introducing Evans and Russell's (1989) creative process model. The aim of the exercise was to enable participants to become aware of behaviours that both helped and hindered their creativity as individuals and within teams.

As the training sessions continued the success of this particular exercise ensured that it formed a key part of each session. It became clear that the same answers to the question were repeatedly emerging regardless of sector, hierarchical level or context. Participants reported engaging in a range of behaviours that actively stimulated and sustained their workplace creativity and that of their colleagues. Respondents reported needing to engage with others formally and informally to discuss issues, access information and generate ideas. They reported their need to disengage briefly from the issue at hand, to refresh their thinking. And finally they reported needing to disengage from other people the better to engage with their own cognitive processes, that is, to work concentratedly on their own. The role, not just of individual skill levels or the social and managerial context, but of the physical environment in people's creativity became increasingly clear. Each participant in the training groups was aware of their personal and group needs for creativity, and anchored them firmly to the places they identified as supporting those needs.

Over the years of practice (between 1990 and 2002) more than a thousand people completed the particular exercise described above. In each case their answers to the key question fell within the same range of place and creative behaviours. An opportunity to test these observations arose in 2001 when a client invited me to work with him on his North of England semi-conductor fabrication plant. His aim was to create a space that would, as he said, "make my engineers think better". The space was also to include a number of incubator/start-up units for new businesses and finally to be a resource for local schools, colleges, universities and businesses. The framework of creative behaviours that had been emerging over the previous ten years' training sessions (in his, as well in other organisations) informed the design of the space. Working with MSSI architects I designed a thinking space that did indeed help the company engineers to think better, as measured by a post-occupancy evaluation (POE).

Two further POEs were conducted with the incubator businesses, one within a month of the companies moving into their new premises, and the second a year later. In both POEs the tenants of the incubator/start-up units confirmed that being able to use the adjacent thinking space actively enhanced their businesses and increased their status with clients: "This place is my silent salesman", "Problem-solving is so much easier" and "We use the Creative Centre a lot. It [is] relaxed and informal, but with something serious to deliver. It gets people talking."

Building on this work by assessing the potential of other commercial buildings (workspaces, systems and employee skills) to better support user creativity, I discovered that all the buildings assessed held the potential to increase the creativity of their users. On a pragmatic level, the insights from my previous observations were sound. This rekindled the desire to not only examine the data, but also to test their validity in a rigorous academic framework.

The data, particularly round the kinds of activities that people engage in to stimulate and sustain their creativity, are the starting point of this thesis. They also constitute a key part of the thesis' data, permitted through the thesis' constructivist grounded theory methodology. The thesis is, therefore, rooted firmly in my professional practice, particularly in the years 1990 – 2002, and in the data and preliminary findings emerging from that practice.

The research is situated inside this context of professional practice rather than an external viewpoint. The questions raised by this professional practice are intensely practical: Does the physical environment make a difference to whether or not people are creative in the workplace? If so, what are the elements that make it so? Can these elements be identified, and if so, can they be reproduced elsewhere?

The professional practice not only raised these questions, but also provided observations that have given early direction to this study. This study's initial research started out with the aim of establishing whether or not a link between the physical environment and the creativity of the people working in it could be shown to exist. The literature review, however, demonstrated that this link is already established. The impetus of the study, therefore, moved beyond the initial questions into a further one: Is there an underlying theory and structure that can inform the design and assessment of workplaces for optimal staff creativity?

The design of commercial workplaces is largely informed by build and ongoing maintenance costs (Philip 1996). When a client asks for something over and above the ordinary, including support for creativity, architects and designers will draw on experience and intuition for their inspiration. Where this is successful a great workplace is created, and the research cites some of these spaces. Where it is not successful, or where the brief does not include a direction to support staff creativity, the workplace can become a place where, in the words of one of the research respondents "your whole body just slumps". The damaging effect of such workplaces is addressed in this research. In my professional experience it has impacted not just the people in the respective organisations but me as well when delivering training and development in these environments.

Much has been written about how organisations support and encourage their workforce's creativity and innovation through managerial and social mores, and through the development of people's skills. The impact of organisational culture and individual ability upon workplace creativity is acknowledged within the thesis and an interaction model of creative behaviour is presented in Chapter 3. Here the independent variables of organisational or social culture, people skills, and physical environment are explored in relation to each other.

1.2 Thesis structure

The research draws upon several fields of knowledge (see Figure 1). The research was initially informed by the field of creativity research and its sub-field of creativity and innovation management, but as the questions expanded so did the research's main and cognate fields. The research is therefore additionally informed by the fields of architecture and environment and planning, specifically their subsets of architectural and environmental psychologies; and by the field of linguistics with particular reference to visuospatial grammars. Figure 1 (below) describes this inter-relationship, where the main field of research is found in the intersection of the cognate fields of creativity research, architecture and environment and planning, and linguistics.

 The research question changed from focusing on the link between the physical workplace and creativity, to a focus on discovering the framework that articulates this link. In doing so the research offers an explicit grammar of creative workplaces, founded in the research data and in the literature.
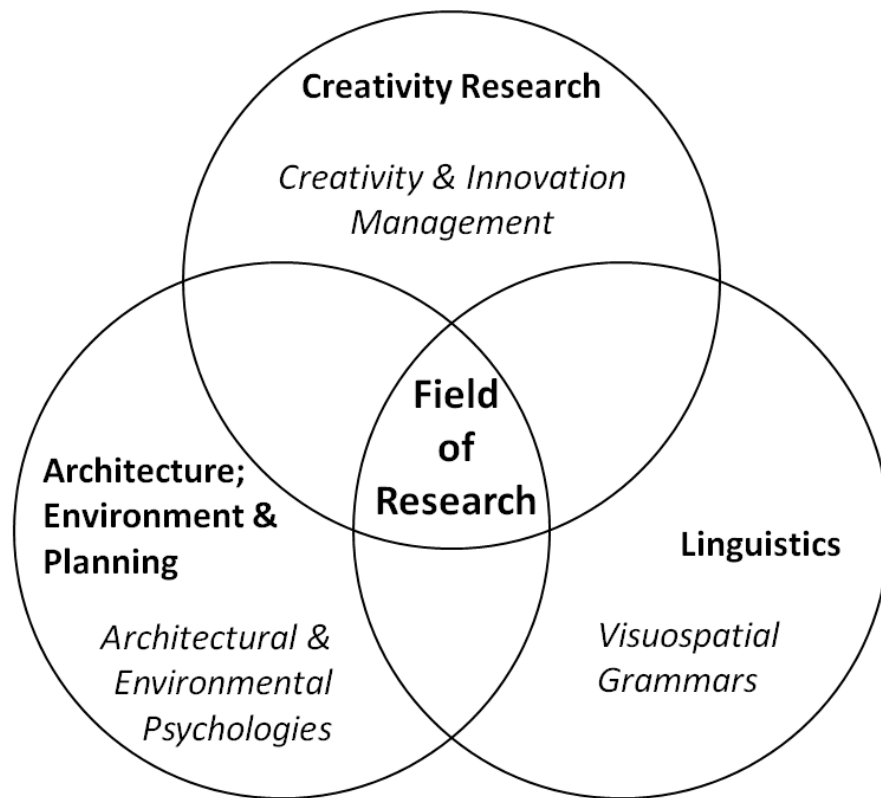
Figure 1: Main and cognate fields of research in relation to each other

This thesis is set out chronologically. It follows the emergence of the grammar of creative workplaces from its origins in the observations of professional practice, its emergence from the research data and findings, in the literature of the respective cognate fields, to its application in two test environments and finally its setting out as a theoretical grammar. There are two parts to the thesis. In the first part (Chapters 1, 2, 3, 4 & 5) the grammar emerges through the research process; in the second part (Chapters 6, 7 & 8) the grammar is presented, described and tested, and its future development discussed.

The literature that informs the research is reviewed in Chapter 2, setting the study within its initial research context and laying the foundations for the later exploration of the data and findings. The literature of creativity research, creativity and innovation management and architecture is reviewed, as is the relevant literature on grammars and meaning. The chapter concludes that there is a dearth of research on the impact that physical space has on creativity. It also identifies a possible cause for this, and brings forward physical determinism as the concept that may, through the extreme position it adopts, have deterred researchers from exploring possible links. Chapter 3 offers a resolution to this issue in the interaction model of creative behaviour in which physical

space is one of three independent variables that interact with each other to form a mediating or intervening variable of perception. The model, drawing on Franck's (1984) work, posits that the impact of the physical environment is a mediated one, and hence the issue of determinism is no long relevant. The research methodology is examined in Chapter 4. The methodology used is that of constructivist grounded theory (Charmaz 2000), an evolution of Glaser and Strauss's (1967) positivist grounded theory. With its iterative data collection and analysis it lends itself to the examination of complex areas. Within the methodology sit further methods of case study and testing.

The research – data and findings – is set out in Chapters 5 and 6. Chapter 5 explores the data and findings from the first research stage of professional practice, focus group and interviews. The findings from this data are then augmented and deepened and at the same time subjected to rigorous scrutiny through a further stage of three case studies. As the grammar of creative workplaces emerges from these findings in its initial form, it is put through a series of tests in academic and commercial organisations which are described in Chapter 6. This third research stage also enriches the data categories through the constant comparator method of constructivist grounded theory.

In the final part of the thesis the grammar is described in detail. Chapter 7 examines the structure of the grammar: its lexis, syntax and the meaning that accrues through its application in workplaces, and sets out its theoretical basis. The thesis draws its conclusions in Chapter 8.

1.3   Scope of the research

Any research is carried out within a defined scope, and this study is no exception. The data are collected from self-reporting in interviews, focus groups, electronic surveys and case studies (including direct observation and company documentation). It is, therefore, reliant on what the respondents choose to say: to offer to (or to deny) the researcher. Observations, unless the researcher is embedded in the organisation over time, which this one was not, can only yield partial views of what is happening. The research, therefore, can draw conclusions about behaviour only to the extent that the self-reporting is honest, and to the extent that it triangulates against self-reporting in the same and in other organisations. The use of constructivist grounded theory enables this triangulation in its emergent categories formed by data from many and varied sources including company documentation, data from other organisations and literature reviews. Much of the research, particularly the test phase, consisted of observing physical

environments as well as behaviour, and these physical environments can be reliably considered to be consistent over time[2].

1.3.1 *Limitations of the research*

The research focuses solely on everyday (small-c) creativity in the physical workplace. It does not explore eminent (middle-to-big-C) creativity (these terms are discussed in more depth in Chapter 2). Indeed, in Case Study 1 which was conducted in an advertising agency, the study differentiates the 'creatives', that is, the staff whose job it is to generate creative ideas for advertisements, from administrative and support staff . This thesis does not examine the impact of the physical environment on eminent or big-C creativity. While such a study can be fruitful Csikszentmihalyi (1996) writes on the surroundings conducive to creativity in highly eminent people) and lessons from such a study might usefully be examined in future work, the data for this study is drawn from non-eminent people working in commercial and public sector organisations. Although one of the test phases was conducted in academic research environments, it is the work rather than the learning aspect of the test environments that was studied. Nor does the research examine virtual or electronic environments. The use of different software interfaces or virtual worlds or environments is beyond the scope of this study. It is to be hoped that the grammar may be explored and applied by future scholars in these fields.

1.4 The thesis' unique contribution to knowledge

This thesis proposes, firstly, that the relationship between the physical environment and the creativity of its users is a mediated one. This relationship is described by the interaction model of creative behaviour. The model, while building on the work of others (McCoy 2000; Dul & Ceylan 2011), contributes a new approach to the link between creativity and physical environment, proposing that the link is mediated by the perception of the people in the workplace.

The thesis further proposes that it is possible to identify and codify the elements of physical workplaces that actively stimulate and support people's creativity. It suggests that this holds regardless of the individual preferences, jobs or situations of the people involved.

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[2] The most recent refurbishment of any of the offices studied had been carried out two years prior to the research, and there were no plans to make changes to any of them in the immediate future.

While there are many models and assessments of creativity – traits, personalities, management styles, organisational cultures – there is, to the best of this researcher's knowledge, nothing that models and assesses the physical workplace in terms of its ability to stimulate, sustain and support its users' creativity.

This research makes a unique contribution to knowledge through its proposal of an explicit grammar of creative workplaces: a practical research-based framework for the design and assessment of workplaces for their users' optimal creativity.

Chapter 2: Literature review of creativity research

2.1 Introduction

This thesis proposes a grammar of creative workplaces, emerging from the researcher's professional practice and founded in the data and in the literature. The literature on the thesis' three fields of knowledge: creativity and innovation management, architectural and environmental psychologies and visuospatial grammars are reviewed. The first part of this chapter positions the thesis in its creativity research context, questioning the dearth of literature on links between the physical workplace and creativity and proposing a reason for this. The second part of this chapter looks at the literature that underpins different aspects of the emergent grammar of creative workplaces: linguistic, shape and visuospatial grammars, and the literature of meaning as related to the study. It thus establishes a foundation for all aspects of the grammar of creative workplaces.

2.1.1 Introduction to the literature on creativity research

The literature of architecture, creativity and innovation management, architectural and environmental psychology and creativity research as it pertains to the impact of the physical environment on workplace creativity is examined first. The kind of creativity explored in this study is established, and the issue of everyday creativity is defined. The first part of the chapter then goes on to examine the literature of creativity and the physical environment across psychology, architecture and creativity and innovation management, seeking to identify those key texts that explore the link between creativity and the physical press or environment. Press is that which presses or exerts pressure on those within it (Rhodes 1961; Mouchiroud & Lubart 2006; Kozbelt, Beghetto & Runco 2010). Press subdivides into social press which describes the cultural environment, and physical press which describes the physical environment. Physical press is explored in depth and defined in Chapter 5, Sections 5.2.1 (page 91) and 5.3.3 (page 108). Creativity research can be said to have four overarching areas (Kozbelt et al 2010): creative *people*, creative *products*, creative *processes* and creative *press* (that which presses upon or impacts the people within it) known as the four Ps of creativity. This is adopted as a framework for the review of creativity research literature. Each of the four areas is examined in turn.

Looking first at an overview of the research literature, Table 1 (below) indicates with a tick those research fields in which aspects of the four Ps of creativity are referenced, and with X those fields where there is no reference.

Research Fields	Four Ps of Creativity				
	People	Process	Product	Press (social)	Press (physical)
Creativity research	✔	✔	✔	✔	X
Architecture	✔	X	X	✔	X
Architectural & Environmental psychology	✔	X	X	✔	✔
Visual Perception & Design Psychology	✔	X	X	✔	✔
Creativity & Innovation management	✔	✔	✔	✔	✔

Table 1: Research field in which each of the four Ps are referenced

Creativity research examines the place in creativity of people, process, product and social, but not physical, press. Architectural literature examines social and physical press and people aspects, as do architectural and environmental psychologies and the psychologies of visual perception and design. Only in the field of creativity and innovation management are all aspects of the four Ps fully considered.

As will become clear in this review, there is no serious study of creative physical press within creativity research, and only in the field of innovation management is each of the four Ps given full consideration. This chapter reviews key texts in the field of creativity research, architectural and environmental psychology, visual perception and design theory, architecture and creativity and innovation management. The review of creativity research literature reveals little that is directly pertinent to the issue of creative physical press, despite clear indications from creativity research subjects that they find the issue important. Thus the question arises of why creativity researchers do not tackle it. Key texts relating to creative social press are explored for any indications of the role of the physical environment. The fields of visual and design psychology yield the concept of affordances, making a link between the physical and the psychological, and environmental psychology proposes the concept of physical determinism. This concept is explored in Chapter 3, suggesting a possible response to the question of why there is a paucity of research into a creativity/physical environment link.

2.2 Everyday creativity

There are probably as many definitions of creativity as there are people who research it. This research adopts creativity's three common underlying characteristics listed by

MacKinnon (1962) and echoed by Mayer (1999) of being novel, useful with a valued outcome, and a time-based process. Mayer (1999), summarising all the papers in *Handbook of Creativity*, concludes that the common characteristics of creativity are novelty and usefulness. MacKinnon's (1962) definition lists three important conditions for true creativeness: novelty or 'statistical infrequency', being situated in reality with a recognisable goal, and a sustained development of the original idea, creativity being 'a process extended in time and characterized by originality, adaptiveness, and realisation' (1962: 485). Boden (1999) posits two kinds of creativity: h-creativity (historical) which changes cultures and history, and p-creativity (personal) where ideas are generated that are new to the generator without being culturally or historically significant. Harrington (1990), in his formulation of an ecology of human creativity, differentiates between private creativity and social creativity, where private creativity has value for the person engaged in the creative activity, and social creativity is of value to, and impacts upon, people other than the creator.

In parallel with these definitions sits the concept of creativity as a continuum between big-C creativity[3] which, as with Boden's (1999) h-creativity, changes culture and history, and small-c creativity with which people solve problems and make improvements to their work and their life (Amabile 1983; Simonton 2005; Runco 2007). Amabile posits that

> [...] it is reasonable to assume a continuum of creativity – from the lowest "garden variety" levels where ordinary individuals are doing everyday things in appropriate ways that are somewhat novel, to the highest levels of creativity where geniuses are producing notable work that transforms fields and even societies. (Amabile 1983: 38)

Runco (2007) posits a continuum that moves between small-c effectiveness (routine problem-solving) and big-C originality (psychosis[4]) via interim stages: routine problem-solving to innovation to creativity to psychosis. Richards sees everyday creativity 'in terms of human originality at work and leisure across the diverse activities of everyday life' (Richards 2010:190).

Because the focus of this research is creativity in the workplace, creativity is, unless otherwise stated, something novel and useful, coming from the small-c end of the

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[3] Simonton (2010) further extends the continuum by adding **Boldface-C** creativity to encompass creative geniuses, as distinct from highly eminent persons.

[4] The long-standing issue of a link between creativity and psychosis is touched on later in this chapter, but as it sits at the big-C end of the creative continuum is not integral to this study.

creativity continuum, and involving p- rather than h-creativity. Small-c creativity is now a legitimate area of study, sometimes known as everyday (Richards, 2010; Moran, 2010) or functional creativity (Cropley & Cropley, 2010), and has been extended into such areas as education (Smith & Smith 2010) and organisations (Amabile 1983/1996; Puccio & Cabra, 2010).

2.3 The four Ps of creativity

The definition of creativity as having the characteristics of novelty and usefulness underpins research into four principle aspects of creativity: creative people, their personality, traits, backgrounds and skills; the creative process, the intrinsic and extrinsic dimensions of how creativity happens; the creative product, outputs or end results of creativity; and creative press (Rhodes, 1961; Mouchiroud & Lubart, 2006), that is, the environment within which creativity occurs. Press is most often used to describe the effect (or pressure) of the social rather than physical environment on an individual's or group's creativity. Key texts in the social aspect of creative press (Amabile's social psychology of creativity (1983/1996), Csikszentmihalyi's domain theory of creativity (1990), Harrington's ecology of human creativity (1990)) are reviewed later in this chapter. The small amount of literature relating to creative press as the physical environment (physical press) is also reviewed. The omission of physical press from MacKinnon's definition and from much of the wider literature on creativity is explored later in this chapter. As recently as 2010, for example, Kozbelt et al in reviewing *press* as an aspect of creativity say only that 'there are individual differences in terms of preferred environments' (Kozbelt et al 2010: 25). They then move immediately to such social environment concerns as support, and the opportunity for exploration. Chapter 3 offers a view on this omission, building on Franck's work on physical determinism (1984), a term which is introduced later in this chapter.

This review considers key texts on press (social and physical), people, process and product as they relate to everyday creativity. The further development of the four Ps to six Ps with the addition of persuasion and potential (Kozbelt et al 2010) is seen within the context of this research as being a subset of the interaction model of creative behaviour, introduced and addressed in Chapter 3.

2.3.1 *The Creative Person*

The study of creativity has its roots in the study of creative people: what defines a creative person, what their traits, personality, skills and background are, and how those influence their levels of creativity. Historically, the view of creativity for many centuries has been founded on the idea of genius, a concept originating with the ancient Greeks (Albert & Runco 1999) and associated with god-gifted abilities and fortune. Although Guilford (1950), in his address to the American Psychological Association, legitimised psychology research into subjects who were not perceived as highly creative (non-eminent), the research community has been slow to take up the challenge. Much of the research done in the last 120 years has been concerned with eminent subjects, that is, those whom society agrees – through reputation or awards – are highly creative in their field (Nordau 1895, Cox 1926, Csikszentmihalyi 1996; Simonton 2010). It is possible to trace through the years research that has been done on different aspects of the creative person. The research develops from a pejorative nineteenth century perspective in which creativity is equated with ego-mania, vague and incoherent thought and a tendency to impulsiveness or doubt (Lombroso 1877; Nordau 1895), through a twentieth century elitist (and mainly artistic) standpoint (Feist 1999) in which key characteristics include affective illness, drive and ambition and aloofness; to a twenty-first century view of the creative person where their creativity is a character strength (Peterson 2006).

Where the nineteenth century researchers saw a personality trait of 'excessive originality', the twentieth century researchers see 'nonconformity' and the twenty-first century researchers see 'thinking of novel and productive ways to do things'. These shifts in perspective are clear across all the categories in Table 2 (below). It can be suggested that the change in perception over the centuries echoes its social context. In their paper exploring the history of research on creativity, Albert & Runco point out 'the social significance and potential dangers of originality and individualism in the context of [nineteenth century] compliance to authority and maintenance of social order' (1999: 22). This contrasts sharply with the twenty-first century view where 'Powering the great ongoing changes of our time is the rise of human creativity as the defining feature of economic life. Creativity has come to be valued […] because new technologies, new industries, new wealth and all other good economic things flow from it' (Florida, 2002: 21).

19th Century: Eminence & Genius (Lombroso, 1877; Nordau, 1895)	20th Century: Artistic Creativity (Maslow, 1968; Mendelsohn, 1976; Feist, 1999)	21st Century: Creativity as Character Strength (Csikszentmihalyi, 1996; Peterson 2006)
Aboulia [loss of willpower] Vague and incoherent thought Tendency to impulsiveness or doubt	Impulsivity Norm doubting	Much physical energy, and often quiet and at rest Smart and naïve at once Vitality
Inability to focus attention Apathy	Greater attentional capacity [to attend to many things at once]	Exploring and discovering Finding all topics and subjects fascinating
Tendency to 'inane reverie' and inability to suppress 'irrelevant associations'	Fantasy-orientated Imagination Openness to experience	Alternate between imagination and fantasy, and a rooted sense of reality Curiosity and interest Humour
Excessive originality Rebellious inability to adapt to the environment	Nonconformity Independence Self-actualisation	Thinking of novel and productive ways to do things/Exploring and discovering Passionate about their work, and objective about it
Over-emotionality Exaggerated mutism or verbosity	Emotional sensitivity Anxiety Affective illness	Openness and sensitivity Extrovert and introvert Appreciation of beauty and excellence
Moral insanity Loss of moral sense	Lack of conscientiousness Hostility Aloofness Unfriendliness Lack of warmth	Escape rigid gender stereotyping Rebellious and conservative Responsible and irresponsible Playful and disciplined Authenticity/honesty
Pessimism		Hope
Ego-mania Excessive preoccupation with self Morbid vanity	Drive Ambition	Persistence Proud and humble

Table 2:   Comparison of creative character traits in 19th, 20th and 21st century research

The contrast between the different perspectives is key to this study. Creativity as a character strength is accessible to everyone at every point in the creative continuum:

> Throughout our day, whether at home or at work, we humans adapt and innovate, improvise flexibly, at times acting from our "gut feelings", at times from options we imagine and systematically try out, one after the other. Our creativity may involve anything from making breakfast to solving a major conflict with one's boss. (Richards 2010: 190)

This is a study of everyday creativity of non-eminent research subjects in a work context rather than a study of those whom society considers eminently creative.

2.3.2 The Creative Product

A second principle aspect of creativity is the creative product. Because creative products are usually objectively present or realised (MacKinnon 1962), they are more easily observable (Cropley & Cropley 2010) than a cognitive process or personality traits. There are, however, elements of subjectivity and context to be taken into account, especially in works of art. Amabile's (1983/1996) testing framework concluded that a panel of experts, when judging the creativity of a haiku or a collage, could reach consensus on what was and was not creative. Harrington avers that: 'Recent analyses have shed considerable light on the ways by which the value of a literary or artistic work is partially created by complex social processes within the literary and artistic worlds that receive those works' (1990: 146). The role of the context continues to be explored in such areas as Csikszentmihalyi's domain theory of creativity (1988a).

Returning to the definitions of creativity examined earlier in this chapter, a creative product must be one that is novel, fulfils a real and recognisable goal and adds value in the context for which it is produced (MacKinnon 1962). This holds true whether the creative product is a small-c problem solved at work – Cropley & Cropley argue that functionally creative products are 'useful, novel products that solve concrete problems in real life' (2010: 304) – or a big-C scientific theory, work of art, invention and so forth that impacts and changes culture (Boden 1999).

2.3.3 The Creative Process

The third P is central to creativity, the processes by which people get and develop both big-C and small-c creative ideas. The creative process continues to be a main area of

creativity research, which has focused predominantly, through the nineteenth and twentieth centuries (Becker 1995) on individual internal or cognitive creative processes. Writing in 1983 Amabile observed that 'a focus on creative persons, creative personalities, and creativity skills still dominates the field.' (Amabile, 1983/1996:16-17)

Increasingly, however, researchers are investigating group creative processes within a team or collaborative environment, and also how ideas are generated through the iterative interaction between an individual and a group.

Creative processes are an integral part of this study, examining what people do in order to access and sustain their creativity as individuals and in work teams and groups. A study of the literature pertaining to the creative process is therefore of key importance. The key texts for all three creative processes – individual, group and iterative – are reviewed and their specific perspective on the creative process set out in Table 3 below.

Table 3 (below) describes the different creative process models in the chronological order in which they were developed. An early individual creative process was identified by Poincaré (1913) and formalised by Wallas (1926) into four stages: preparation, incubation, illumination and verification. This was then further developed by Evans & Russell (1989) who added an extra stage of frustration, making the model circular rather than linear. Csikszentmihalyi (1996) also adapted Wallas' model into a circular one and sub-divided the verification phase into evaluation and elaboration. Tatsuno's (1990) group creative process is based on his observations in Japanese manufacturing plants. It too has five stages: recycle, search, nurture, breakthrough and refine, each of which is informed centrally by the core values of the organisation. Iterative creative processes have emerged from different sources. Sawyer (2003) derived his from improvisational theatre, talking of synchronic interaction with its ideation/evaluation loop. Resnick (2007) developed his spiral model of creativity from close observation of kindergarten children. Its five stages of imagine, play, create, share and reflect build iteratively between individual and peer group.

Author	Date	Research Subjects	Process	Creative Process Stages					
				Stage 1	Stage 2/3		Stage 3/4	Stage 4/5	Stage 5
Individual creative process									
Wallas	1926	Eminent	Linear	Preparation	Incubation		Illumination	Verification	
Evans & Russell	1989	Non-eminent/ organisational	Circular	Preparation	Frustration	Incubation	Insight	Working Out	
Csikszent-mihalyi	1996	Eminent	Circular	Preparation	Incubation		Insight	Evaluation	Elabora-tion
Group creative process									
Tatsuno	1990	Non-eminent/ organisational	Circular (mandala)	Recycle	Search	Nurture	Break-through	Refine	
Iterative creative processes									
Sawyer	2003	Non-eminent (creatives)	Iterative	Ideation/Evaluation loop					
Resnick	2007	Non-eminent (children & researchers)	Spiral/ iterative	Imagine	Play		Create	Share	Reflect

Table 3: Comparison of individual, group and iterative creative process models

Each of the key texts on the creative process in Table 3 is important to this study. The stages they identify, and the different behaviours with which people facilitate their creative process in each of the stages, become an integral part of the grammar of creative workplaces.

2.3.4 Creative Press: Social

As previously indicated, the creativity research community has viewed creative press predominantly in terms of how social, rather than physical, environments impact (put press or pressure on) the creativity of those working within them. Three key texts are chosen for the pertinence of their core concepts to this research, and because of each of the researchers touches upon, however briefly, the issue of physical press. Amabile's (1983/1996) work explores in depth the concept of the social psychology of creativity, Harrington (1990) introduces the concept of the ecology of creativity and Csikszentmihalyi (1990) puts forward his domain theory of creativity. Each researcher's references to physical press are examined in Section 2.3.5 on the following pages.

Amabile's (1983/1996) concept of the social psychology of creativity has been immensely influential within the field of creativity research. Amabile was among the first to argue that a continuum of creativity exists between the small-c creativity of everyday life to the big-C transformative creativity of genius, thus extending her study of creativity into the workplace. Amabile argues that an individual's ability to be creative is affected by extrinsic (social) factors, intrinsic (personality) factors, and the effect of cognitive mechanisms on motivation, hence impacting people's creativity. One key finding is the difference in impact that extrinsic and intrinsic motivation can have on people's ability to be creative: intrinsic motivation led to higher levels of creative output. This concept has been further developed in recent research (Amabile & Kramer 2011) applying the findings to organisational management and the link between motivation, productivity and what Amabile & Kramer call 'inner work life' or positive emotions. This work relates to positive psychology (Csikszentmihalyi 1996; Peterson 2006), reviewed in the previous section, from which the concept of creativity as a character strength emerges.

Harrington's (1990) ecology of creativity uses the metaphor of a biological ecological system to consider the part that society plays in supporting and generating creative outputs, including assessing the value of those outputs. He puts forward the concept of social creativity, holding the view that creativity itself is an output of a human ecosystem,

as well as of individuals. Harrington's model balances 'the psychosocial demands placed on creatively active people and their ecosystems, [with] the personal and ecosystem resources meeting the psychosocial demands of creative processes' (1990: 155). Thus in the same way that the properties of a biological ecosystem sustain life within that ecosystem, so Harrington suggests what might be the properties of an ecosystem and environment that would sustain creativity:

> [M]any of the theoretically implicated environmental and personal properties [of a creative ecosystem] can be roughly paired. For example, while creatively active individuals need *courage,* creative ecosystems should provide *encouragement.* While creatively active people should be curious and exploring, creative ecosystems should encourage exploration and "playing around" with ideas and materials; and so on. What links these paired properties of people and environments, of course, are the psychosocial demands of creative processes. (Harrington, 1990: 157-158)

Csikszentmihalyi (1990) adopts a systems approach to creativity, positing a three-part model of society/field; culture/domain; personal background/individual in which all three elements work upon each other to produce novelty. He thus moves beyond the point of view that creativity is solely an internal process of mind. Csikszentmihalyi uses environment throughout in a social, rather than physical, sense. His data are drawn from people working at the big-C or eminent end of the creativity continuum (Amabile 1983/1996; Simonton 2005) and from that perspective he concludes that an individual may also influence the domain within which their field is sited.

Thus each of these three key texts introduces the concept that creativity is not just the prerogative of the individual, but also involves a wider social perspective. The next section examines more closely how each of these researchers approaches the issue of the physical environment.

2.3.5 *Creative Press: Physical*

The literature on creative physical press divides into three principle areas: creativity research within a) psychology (including visual perception, environmental and architectural psychology), b) design and architecture and c) organisational management and innovation management. This section examines the few references to physical press within creativity research, finds a possible explanation in environmental psychology for this paucity (expanded in Chapter 3) and gathers relevant literature from the fields of architecture and innovation management. While the previous sections in

this chapter have been short, setting a context to this research, this section is much longer, finding literature pertinent to the study's focus in the fields noted above.

The field of *creativity research* is the first one reviewed for work on physical press. Although the word 'environment' appears extensively in Amabile's work on the social psychology of creativity (1983/1996), it is used in the psychological sense of a social or anthropological environment. She references the physical environment only when referring to Friedman, Raymond & Feldhausen's (1978) research on 'rich environments' that enhanced children's creativity. Amabile's work demonstrates the extent to which the psychological emphasis on the anthropological meaning of 'environment' may exclude possible exploration of the physical meaning. Her work also emphasised the importance of the social aspects independent of any given physical environment.

Harrington's ecology of creativity (1990) takes notice of the different ways creative people create their physical environment. His principal example is of a writer, a single mother who waits until the children are in bed, and then clears the kitchen table so she can write. He says: 'A description of her ecosystem would include information about the physical circumstances of her work space and equipment (issues that often seem trivial to those in comfortable circumstances but that are seen as anything but trivial to those working in constraining circumstances)' (1990: 149). A topical example of this is J. K. Rowling, writing the first *Harry Potter* book at a café table in Edinburgh away from the cold of her unheated flat. Beyond this example Harrington focuses on the psychosocial aspects of 'habitat selection and habitat shaping in the context of creativity' (1990: 161).

Csikszentmihalyi posits that flow is an intrinsic element of creativity (1996). His position, however, is that the physical environment is simply a facilitating element to creativity. He observes: 'A favourable environment seems important especially for activities that could be easily interrupted by outside distractions' (1975b: 69), but does not explore this further, beyond recommending that: '[...] we should try to make the total environment in which we live – from bedrooms to lobbies, from streets to offices and schools – one that is geared to growth' (1975b: 201). Massimi, Csikszentmihalyi & Delle Favé (1988) worked on the onset and continuation of flow across cultures, using a Flow Questionnaire in which environment occurs as one of the nine major categories (devised to identify flow experiences across cultures and age ranges). However, despite the interviewees' responses showing that they understand and value environment as

physical place, as much as social context, Massimi et al consistently use it only in its psychological meaning. Their research subjects gave a high rank to the part that environment plays in creative flow (5th equal and 4th equal respectively on a scale of 10 where 1 is high). It is noticeable that respondents' understanding of environment encompasses the physical place as well as the social environment. Interviewee comments include:

> The place is the most important stimulus: for instance when I am on a train, alone in a compartment…I will automatically tune out and start thinking. The train is one example, and the most frequent one, but an empty waiting room will do as well
>
> [creativity] usually happens when I am in a quiet place
>
> the feeling happens …when I am up there [mountain climbing] away from the noise, the crush of the crowd.   (Massimi et al 1988: 69).

By the time he published his book *Creativity: Flow and the Psychology of Discovery and Invention* (1996) Csikszentmihalyi was exploring more deeply his position on the environment as a facilitating element for creativity. From his interviews with highly creative people, Csikszentmihalyi identifies elements of their practice that 'non-eminent subjects' can apply to their lives. There is a substantial section on 'creative surroundings' (1996: 127-147) and a further sub-section on shaping one's own creative space (1996: 354-357). Csikszentmihalyi focuses almost exclusively on the effect that beautiful scenery and tranquillity can have on people's ability to be creative, listing the number of research institutes across the world sited amid breathtaking scenery. His recommendation is to head for the hills, and failing that to shape one's own creative space, given that not everyone can afford to spend time and money going to wonderful places. He says: 'It is not what the environment is like that matters, but the extent to which you are in harmony with it' (1996:354). However, when he looks at the belief, emerging from his research across many different cultures, that the physical environment affects our thoughts and feelings, Csikszentmihalyi concludes: 'Unfortunately there is no evidence – and probably there never will be – to prove that a delightful setting induces creativity' (1996: 135). This conclusion appears to contradict an earlier position that, seen from the perspective of cultural evolution, the physical contains its own cultural patterns: 'artefacts contain behavioural instructions in that they define the reality in which the physical organism is to operate. Often they also contain explicit directions for action – such as norms, regulation, and laws' (1975: 61). In

saying this, Csikszentmihalyi appears to be drawing close to work on affordances by Gibson (1977) and Norman (1988, 1998) which is examined below.

In *The Cambridge Handbook of Creativity* (2010) press is predominantly described in terms of social press or the socio-cultural approach (Sawyer 2006; 2010) even when place is being discussed (Kozbelt et al 2010). Puccio & Cabra (2010) in their chapter on organisational creativity reference the work on physical press being done within the field of innovation management (see below pages 27-28). The impact of physical space on creativity is notable by its absence.

It is in the field of the *psychology of visual perception* that the concept of affordances arises. This concept is central to this study. The term affordance was coined by Gibson (1968) in his work on visual perception. Gibson (1977) developed his theory of affordances as a significant element of his ecological approach to visual perception. From his cognitive perspective environmental affordances exist as objective properties of the environment, independent of the animal's (or human's) perception. An affordance is defined as the 'specific combination of the properties of [the environment's] substance and its surfaces taken with reference to an animal' (1977: 67) adding: 'the affordances of the environment are what it offers animals, what it provides or furnishes, for good or ill' (1977: 68). Gibson is using 'animal' in its widest sense, to include humans. Gibson relates affordances to the metaphor of the ecological niche, which affords whatever the organism needs to thrive (linking to Harrington's (1990) later metaphor of the ecology of creativity). Gibson contends that affordances exist independent of an observer's need for or use of them, that is, that they are objective affordances. He argues that the affordance of objects and environments is inherent in those objects and environments, whether or not that affordance is perceived. Affordances, for Gibson, are perceived in ambient light which allows perception of surfaces and substance. He introduces senses other than visual only when talking about the affordances that people create for other people, saying: 'The richest and most elaborate affordances of the environment are provided by, [...] for us, other people' (1977 76).

There is some divergence in how Gibson's work is viewed. As Mace (1977) points out in his critique of Gibson's theory, there is a gap between perception and use which Gibson deals with only by positing that the visual system of a mature observer will 'pick up' (1977: 80) the information, as the value of an affordance is inherent in the

offering object or environment itself, in its combination of qualities. Bruce et al (1996: 255-256) disagree with the idea of direct perception (where the information is 'picked up') preferring the concept of perception processed by the mind.

Related to the field of visual perception is that of design psychology, where the theory of affordances is adopted by Norman (1988). Norman deals with the problem of direct as opposed to processed perception that is, where the perceptual information is 'picked up' visually as opposed to mediated by thought. He adapts Gibson's objective affordances to posit perceived affordances that 'provide strong clues to the operation of things' (Norman 1988: 9). These affordances point the user towards how things should be used. This rethinking of affordances is now used extensively in the wider design field, and in HCI (human-computer interface). Norman's work is based on his experience as a designer; his books are practical and their validation has come from their use and application across a wide range of disciplines. The concept of affordances, both Gibson's objective and Norman's perceived affordances, is an integral part of the grammar of creative workplaces, and is explored and expanded in depth in the chapter on findings.

The field of *environmental psychology* is examined next. Environmental psychology is described by Gifford as 'the study of transactions between individuals and their physical settings. In these transactions, individuals change the environment and their behaviour and experiences are changed by the environment' (2002: 1). It is within environmental psychology that a key text *Exorcising the Ghost of Physical Determinism* (Franck 1984) is found, that addresses the dearth of literature on physical press within creativity research. When Csikszentmihalyi says that 'there is no evidence – and probably there never will be – to prove that a delightful setting induces creativity' (1996:135) he is touching upon physical determinism – the idea that people's actions are directly determined by the physical environment. The concept of physical determinism is proposed in this study as a key factor in the reluctance of researchers in the field of creativity psychology to tackle the issue of physical press's impact on people's ability to be creative. Physical determinism is explored in depth in Chapter 3 and other subsequent work examined in conjunction with that of Franck.

Coming from the discipline of environmental design, Franck (1984) critiques the physical determinism perspective: that the physical environment, both built and natural, directly causes behaviour. She defines physical determinism as encompassing both geographical determinism (giving pre-eminence to the natural environment) and

architectural determinism (giving pre-eminence to the built environment). Franck identifies and explores four major weaknesses of the determinist perspective: over-exaggerating the direct effect of the physical environment on behaviour; failing to articulate or measure clearly the role of intervening variables in the environment-behaviour relationship; ignoring the active role that people play within the environment, including making choices; and assuming that features of the physical environment are unalterable, or 'a given' (1984: 427) and so failing to take into consideration the modifications possible in both built and natural environments. Franck argues that these concerns have 'become a barrier to theoretical and empirical development of the field' (1984: 412) and tackles each of the four concerns in turn, building models which offer robust alternatives to the concerns they raise. These models, along with the added elements of choice and modification, are explored and set out in Chapter 3. She puts forward an argument for an empirical approach to the interaction between physical environment and behaviour, elaborating her thesis with two different kinds of effects that the physical environment might have on behaviour: *indirect effects* and *interaction effects*. Franck examines how combinations of environmental features interact with each other and with other influences (non-physical factors) directly and via intervening variables to affect the outcome variable of behaviour.

Franck's paper, written from the School of Architecture at the New Jersey Institute of Technology, reviews the literature comprehensively. She observes that researchers looking at both geographical and architectural aspects of physical determinism have been criticised for ignoring the role that social, cultural and economic factors play in architecture (Gans, 1968b) and in geography (Moos, 1976); and for assuming that the influence of the built environment is more powerful than the influence of social or cultural characteristics (Ittelson et al., 1974). In her reading of Moos' (1976) review of his own research and the literature she concludes that 'we are all determinists, insofar as we believe that in certain circumstances and under certain conditions the environment *does* have some influence on behaviour' (1984: 416)

One key paper is introduced from the field of *architectural psychology.* Duncan Philip explores what he called *the practical failure of architectural psychology*:

> Many years ago Louis Hellman drew a cartoon, illustrating a paper by Terence Lee (1971), which suggested that the (then) recent marriage between architecture (represented by a large lady) and psychology (represented by a small Freud look-alike) was unfulfilling for the female party. Twenty years later

that marriage is no more satisfying for the architectural partner, though formal divorce proceedings have not been entered into' (1996: 272).

Philip explores why the two professions of architecture and psychology have been unable to communicate in a meaningful way. He refers to Franck's (1984) approach to physical determinism, linking it to the architectural view that psychology ought to be able to provide an intellectual basis for successfully designing for the population at large. Philip concludes, quoting experimental work with architectural students, that there is a general perception in the architectural profession of the 'uselessness' (1996: 279) of architectural psychological findings, due in part to the type of language used by the psychologists.

This paper is extremely pertinent to this study, looking at how the architectural profession perceives physical determinism, and highlighting some of the pitfalls surrounding the area to which this study hopes to make a significant contribution.

There is a growing architectural and design literature that directly deals with physical space's impact upon creativity (McCoy 2005; Anthes, 2009; Mallgrave 2010) rather than with the creativity of architects (Fitchett 1998) or creative buildings where the focus is sometimes on an unusual exterior, such as Milunic's Dancing House (1996), or the Longaberger Basket (1997).

This study was initially inspired by the work by Alexander and his team (Alexander, Ishikawa, Silverstein, Jacobson, Fiksdahl-King, & Angel 1977; Alexander 1979) which introduces the concept of pattern language. Pattern language is explained by Alexander as a 'language for building and planning [made up of] detailed patterns for towns and neighbourhoods, houses, gardens and rooms' (Alexander et al 1977: ix). As such it also belongs in the field of visuospatial grammars. Situated in the field of architecture these two books form parts two and three of a trilogy. The first book, *The Oregon Experiment* (1975), describes the process taken by Alexander and his team when commissioned to work with students and faculty on the campus at University of Oregon. The following two books *A Pattern Language* (Alexander et al 1977) and *The Timeless Way of Building* (Alexander 1979) describe the underlying ideas and principles applied in the team's work at the University of Oregon. In response to student unrest and joint student and faculty protest at some of the changes being made to the Oregon campus where permission was being given to logging trucks to drive through the campus, 70s *brutalist* buildings were being erected and there was destruction of nineteenth century features

such as the cemetery. This was also happening in the context of the war in Vietnam and increasing levels of student power. The university authorities commissioned Alexander to work with the campus community on making constructive changes to the campus. In doing so, the aim was to co-create with the campus community physical spaces that actively supported those using it.   There were two central tenets: the first was that the physical environment should *feel* right:

> There is a central quality which is the root criterion of life and spirit in a man, a town, a building, or a wilderness. This quality is objective and precise, but it cannot be named. The search which we make for this quality, in our own lives, is the central search for any person, and the crux of any individual person's story. It is the search for those moments and situations when we are most alive. (Alexander, 1979: ix – x)

The second tenet was that the co-creation process should allow the emergence of an unselfconscious design process, involving the users of the spaces, whereby mistakes in the design are corrected and adjusted as the design and build progresses. In this, the books build on Alexander's previous work (1964) in which he explored the difference between what he termed the 'unselfconscious homeostatic' (self-organising) design processes where users build their own structures from a deep cultural base (for example, the Mousgoum huts of the northern French Cameroun tribes (Alexander 1964: 37-38)) and *self-conscious* design processes where an outside expert, i.e. an architect, creates the design. As Fischer (2004:1) elaborates: 'In an unselfconscious culture of design, the failure or inadequacy of the form leads directly to an action to change or improve it.'

Intended to be taken together (Alexander et al, 1977: ix), the two books that followed on from *The Oregon Experiment* (1975) – *A Pattern Language* (1977) and *The Timeless Way of Building* (1979) – were written out of the experience of the work done in Oregon. They describe both the principles and the practice of designing and building structures in which the users feel they 'are most alive' (Alexander, 1979: x). The first (1977) outlines a set of descriptors (patterns) which can be applied to the design and construction of buildings and the physical environment, and the second gives an account of the principles and origins of *the timeless way* (1979).

In the two books there is only one indirect reference to creativity when discussing the place of water in urban landscape: 'all of us need the opportunity to play with water – because it liberates essential subconscious processes' (1979: 293).   Both texts are, however, essential to the current study in prefiguring elements of the *grammar of creative*

workplaces in their description of 'patterns of events […] interlocked with certain geometric patterns in the space' (1979: x). In this they create a connection between the four Ps of creativity and a formal system of space. It is from these early beginnings, in particular Alexander's work on the synthesis of form (1964) that development into other areas, such as software design and the patterns of creativity, emerges.

Finally, Hillier and Hanson's (1984) concept of space syntax reframes architecture, focusing on the spaces and interconnections between buildings, rather than on the buildings themselves. They posit that buildings, while having a physical existence, exist to create spaces and links between those spaces for human use. Hillier and Hanson attempt 'to build a conceptual model within which the relation [of people and space] can be investigated on the basis of the social content of spatial patterning and the spatial content of social patterning' (1984: x-xi). The mathematical formulae of space syntax allow measurement of the flow of people in those spaces, and application of this data to planning and other decisions.

Space syntax is influential in current building and planning, and Hillier's work has continued to develop both academically and commercially. The idea that space can be analysed into its component parts, and those parts used as the basis of a practical language, is of immense importance to this current study.

It is in the field of *creativity and innovation management* that physical space and creativity finally come together. While there is an important body of knowledge (explored above in the section on *social press*) that discusses creativity in its social and psychological environment and much in the commercial arena that addresses the influence of layout and physical components on organisational performance (Raymond & Cunliffe 1997; in Detail 2011) there is little cross-disciplinary work that links physical press to creative performance (McCoy 2005). Having reviewed the relevant literature in architecture, and the psychologies of creativity, the environment, visual perception and architecture, the review now looks at creativity and innovation management literature with its application of models to practical needs. The field has a body of work examining specialist 'future thinking' environments as well as day-to-day workplaces, driven by the economic importance of work-related creativity (Haner, 2005; Dul & Ceylan, 2011), and the need of organisations to capitalise on the brain-power of their workforce. The emerging research area of the place of creativity in the interaction between workforce and workplace is examined in Tatsuno's (1990) work, in five key papers on 'future

spaces' (Kristensen, 2004; Lewis & Moultie, 2005; Haner, 2005; van der Lugt, Janssen, Kuperus & de Lange, 2007; Moultrie, Nilsson, Dissel, Haner, Janssen, & van der Lugt, 2007) in a thesis by McCoy (2000) which examines the interaction between physical space and creativity in teams, and in two papers by Dul & Ceylan (2011) and Dul, Ceylan & Jaspers (2011).

In his work on group creativity Tatsuno (1990) tackles the issue of physical space from a strategic perspective: how Japanese companies are endeavouring to counteract cultural restrictions on creativity. He describes how office design is being used to actively promote creativity in the workplace, and references the infrastructure put in place by the Japanese Ministry of International Trade and Industry (MITI) specifically to nurture idea-generating in 'creativity-inducing environments'. In these environments employees are given the physical space to escape 'from the hustle and bustle of the office [and] the goal is to create a mood for more creative research and more productive human interaction' (Tatsuno, 1990:90-92). As referenced earlier in the section on group creativity this is done in conjunction with formalised idea-generating processes.

The economic pressure on companies to capitalise on every square foot of floor space is indicated by Haner (2005) who cites O'Mara (1999: 5) and Bauer (2004: 21) in support of his assertion that 'companies are seeing real estate – and the work environments therein – as enabler of strategic action, and strive for transforming them into centres of creativity and innovation' (2005: 288). Researchers in this emerging field of interaction between workforce and workplace agree that 'there is limited knowledge on how the physical space actually enhances creativity' (Kristensen, 2004: 89) and that 'the spatial dimension has been largely neglected in the literature when focusing on creativity or innovation' (Haner, 2005: 291) despite the fact that the link has been perceived for some time. Olsen et al (1998) quoted by Moultrie et al (2007: 55), say 'environmental design carries the potential of having a direct impact on worker morale and productivity'. Much of this work is published in *The Journal of Creativity and Innovation Management*. The first four key papers by Lewis & Moultie (2005); Haner (2005) van der Lugt et al (2007); and Moultrie et al (2007); describe organisational Innovation Centres, or Future Centres, and investigate their design and use. In the fifth key paper Kristensen (2004), in examining the physical context of creativity, links the physical environment to its management, thus coming full circle to Amabile's social psychology of creativity. An analysis of the papers can be found in Appendix 1.

In her thesis: *The Creative Work Environment: The Relationship of the Physical Environment and Creative Teamwork in a State Agency: A Case Study*, McCoy states: 'a significant relationship does exist between the features and properties of the physical environment and creative achievement of teams' (2000: 252). McCoy studied team creativity within a work environment, that environment being a dynamic system 'of many integrated and sometimes interdependent subsystems' (200: 257) in which creative achievement is an outcome. She concluded that 'the physical environment plays an integral role in that system' (2000: 257). Based on an extensive case study of teams working in a US government department, McCoy's work follows teams assessed by the organisation to be at different levels of creative performance. These are: breakthrough creativity, distinctive creativity and incremental creativity, and can be mapped against Simonton's big-C to small-c creative continuum (2005). McCoy contributes a systems model of creative achievement derived from the government department teams she observed (2000: 235) in which there is a dynamic interaction between the physical features of the environment and three independent subsystems: a system of control (the degree of control users have over the design and use of their physical environment), a system of self-expression (the non-verbal expressions, artefacts and similar of team activities and focus), and a system of functional opportunities (possibilities for communication and collaboration within and without the team). McCoy concludes that teams, in order to foster their creative behaviours, need a) diverse areas in which to work collaboratively and without interruption, b) a high degree of control over the design and use of such areas including 'unusual or unexpected requirements that could not be foreseen by a facilities planner or designer whose focus is on efficiency and cost' (2000: 254), and c) a physical environment that affords maximum opportunities to be able to communicate, think and act together. She also concludes that 'standardised work areas and conference rooms, while they may be the most efficient use of space or cost effective system of facilities planning and management, are less likely to be the most appropriate system to support creative team work' (2000: 254). Through a systematic and rigorous methodological process McCoy establishes the link between the physical environment and creative performance of teams of different levels of creativity.

Dul & Ceylan (2011) and Dul et al (2011) examine both the social-organisational work environment and the physical work environment, setting out twenty-one elements of each that 'are possibly related to creativity' (Dul et al 2011: 719, 721) or that 'can foster creativity' (Dul & Ceylan, 2011: 14). Both papers are based on surveys conducted across

samples of, respectively, 409 and 274 employees and focus on day-to-day work environments rather than specialist 'future space' environments (for example Moultrie et al, 2007). Each paper sets out a conceptual model exploring the relationship between the creative person, the physical work environment and the social-organisational work environment. The papers examine the impact of these three independent variables upon creative performance, mediated in Dul & Ceylan's (2011) version by creative process.

Taken together, these studies (Tatsuno, 1990; McCoy, 2000; Kristensen 2004; Haner 2005; Lewis & Moultrie, 2005; van der Lugt et al, 2007; Moultrie et al, 2007; Dul & Ceylan, 2011; Dul et al, 2011) build on earlier work by Alexander (1979) and by Hillier & Hanson (1984) in making the link between physical press and active support for users' creativity.

2.4   Literature on grammars

This thesis proposes a grammar of creative workplaces. Grammar is the set of rules by which languages are ordered and governed (Chomsky 1957; Lyons 1970; Thomas 1993) or 'the codification of the linguistic practices of a group of users of a language' (Kress & Van Leeuwen 2002: 344). Although linguistic grammar is an ancient discipline[5] this thesis is concerned, with only one exception, with grammars from the 20th and 21st centuries. This section explores the literature on linguistic (English-based) and non-linguistic grammars, focusing on visuospatial grammars and grammars of shape. It also reviews the literature on meaning as it pertains to the grammar of creative workplaces.

This section of the Literature Review looks at the emergence in the twentieth and twenty-first centuries of grammars in non-linguistic disciplines such as architecture, design and design methodology, and environment and planning. Relevant areas are examined in overview: grammar's twentieth century developments in linguistics; the emergence of non-linguistic grammars including visuospatial grammars; and the relation of syntax to meaning across grammars in different fields. This is done through, firstly, an examination of the theory of transformational (generative) grammar as defined by Chomsky (1957; 1969) within the field of linguistics, with its view that grammaticality can be divorced from semantic meaning. Chomsky's work is then examined in relation to its application in other fields notably that of shape grammar in the fields of environmental planning, architecture and design, with particular reference

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[5] See for example, Panini's work in 5th Century BCE India on phonemes, morphemes and roots; Apollonius Dyscolus' 2nd Century CE thirty theses on different aspects of Latin grammar.

to the work of Stiny & Gips (1972) and Stiny (1975, 1985, 2006). The section then explores the work, both in linguistic and non-linguistic grammars, of grammarians who see syntax as semantic (syntax-semantic) and introduces in particular the work of Alexander et al (1977), Alexander (1979) and Sass (2007). Finally the section examines non-linguistic grammars whose function is primarily descriptive, focusing on Laseau (1975; 2001).

2.4.1 *Definitions of grammar and grammaticality*

Grammar can refer both to the structure of a language, and to the study of that structure and its functions:

> There is a warning to be issued in connection with the term "grammar". It is not uncommon in English for the same word to stand both for a phenomenon itself and for the study of that phenomenon. For example "psychology" is used to mean both the study of the "psyche" and the psyche itself. [...] In linguistics, while we do distinguish "language" (the phenomenon) from "linguistics" (the study of the phenomenon), we fail to make such a distinction with the word "grammar", which means both the grammar of a language and the study of grammar. (Halliday and Matthiessen 1999: 6)

Halliday & Matthiessen's caveat (1999) is especially pertinent to this study, where the term grammar is used both as a title for the language studied, for example: shape grammar for the language of shapes, linguistic grammar for the language of words, movement grammar (*choreutics*) for the language of dance, and as a description of the study of that language, for example: generative grammar (Chomsky 1957), Construction Grammar (Goldberg 1995), cognitive grammar (Langacker 1987, 1991; Halliday & Matthiessen 1999); shape grammar (Stiny1975; 1980) among others.

The three basic elements common to all grammars studied are a) the lexis or component parts of the language (sounds, words, shapes, movements, symbols, depending on the language studied), b) the syntax or rule set ordering those component parts, and c) the meaning resulting from that ordering. The lexis is the complete set of constituent parts that are available for use by any user of the language, while vocabulary is the set of constituent parts which any one person is able to use with a greater or lesser degree of fluency. The study of syntax explores what those rules are, and how they are applied to the relationship between constituent parts. In linguistics syntax underlies the construction of sentences, generating first the phrases, then the ordering of those phrases, to form sentences. Meaning within linguistics is categorised as semantic or pragmatic, dependent on whether it creates meaning internally (semantic) within the

sentence (Vigliocco 2000), or in relation to an external context (pragmatic). Visuospatial grammar in this thesis refers to those non-linguistic grammars within the fields of architecture, design, and movement whose constituent parts are made up of images rather than of words.

While grammar refers to the structuring of a language's components, *grammatical* indicates a sentence's acceptability to a native speaker. In linguistics Thomas posits that the grammatical or ungrammatical nature of a sentence is determined purely by whether or not it is syntactically 'well formed' (1993: 3), that is, dependent on word order. Chomsky (1957: 94) posits that a) there is no direct correspondence between semantic studies of language and 'the problem of determining or characterising the set of grammatical utterances', and that b) 'grammar is autonomous and independent of meaning' (Chomsky 1957:17). Chomsky posits that the sentence *Colourless green ideas sleep furiously* is syntactically acceptable in a way that **Furiously sleep ideas green colourless* is not[6] (Chomsky 1957). There is an ongoing debate about Chomsky's (1957) emphasis on syntax rather than semantic meaning in his transformational grammar. Some linguists (Lakoff, Langacker, Goldberg among others) have defined other types of grammar which are syntax-semantic rather than syntax-neutral. Critics of Chomsky such as Minsky and Schank posit that meaning is possible without syntax (one example is the ease with which the phrase 'thief, careless, prison' can be understood), but that syntax is not possible without meaning. Pinker (2000) however sees each side of the debate as being different aspects of the use of language in understanding both stories and conversation. Grammaticality, and what it means within a visual language, is examined later.

That the 20th century has been called the 'century of linguistics' is in part due to the work of Noam Chomsky. Chomsky has, among his other achievements,[7] developed a theory of generative or transformational grammar: 'a system of rules that can iterate to generate an indefinitely large number of structures [in language]' (Chomsky 1969: 15). Transformational grammar in Chomskian terms, is generative. Although the two terms are often used interchangeably, in this study the term *generative grammar* is used throughout. This specifies the generation of all possible sentences from the available

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[6] In linguistics words and sentences that do not conform to rule sets are preceded by an asterisk; for example *rodw; *Boy train that this likes.

[7] A further major contribution to the field of linguistics made by Chomsky has been his exploration of a bio-linguistic perspective of language as integral to the body, as are other cognitive systems (Chomsky 2005).

words (or morphemes) of a language through 'an infinite set of abstract formal objects, each of which incorporates all information relevant to a single interpretation of a particular sentence' (Chomsky 1969:16). Chomsky posits that 'the syntactic component of a generative grammar contains a *transformational* subcomponent' (Chomsky, 1969:17) which enables the generation of a sentence from its syntactic component (Chomsky 1969: 16-17). Because his position is that syntactic grammaticality has no semantic component, Chomsky is free to create a syntactic system which can be 'studied abstractly, with no specific reference to particular languages' (Chomsky, 1957:11). This therefore opens up the possibility of applying the syntactic system's framework to other disciplines: the rule set becomes an algorithm that can inform the development of grammars beyond the bounds of linguistics.

Chomsky's work is important to this study because it forms the theoretical basis for generative grammars of all kinds, non-linguistic as well as linguistic.

2.4.2 *Application of generative grammar beyond linguistics*

The semantic neutrality of generative grammar permitted its application beyond the study of language into other disciplines, in particular those concerned with visual studies, architecture and design. This basic principle of Chomsky's work was applied through computer programmes to visual studies; the first such paper is the work by Stiny and Gips: *Shape Grammars and the Generative Specification of Painting and Sculpture* (1972). This paper is an early introduction to shape grammar and its subsequent applications. In it the authors present shape grammar as 'a method of shape generation using shape grammars which take shape as primitive[8] and have shape specific rules. [The authors then outline] a formalism for the complete, generative specification of a class of non-representational, geometric paintings or sculptures [...] which has shape grammars as its primary structural component' (Stiny & Gips 1972: 125). Following this paper's publication, Stiny further expanded his thinking on shape grammar, combining the disciplines of design and computer science in his interdisciplinary system research (1975). He developed 'pictorial and formal models of shape and shape grammar' (1975: 1) allowing the exploration of 'some possibilities for an algorithmic formulation of aesthetics' (1975: 1). Stiny outlined his study thus: 'Shape grammars provide a means for the recursive generation (construction) of shapes' (1975: 26). Individual shapes can be defined pictorially as 'occurrences of straight or

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[8] "That is, definitions are made ultimately in terms of shape." (Stiny & Gips 1972:130)

curved lines, connected or disconnected lines, or open or closed lines' which can be combined using a process of manipulation to create a *shape union* (Stiny 1975: 5).

Stiny acknowledges his debt to Chomsky: 'Shape grammars are similar to phrase structure grammars which were originally used by Chomsky in linguistics' (Stiny 1975: 28), drawing a parallel between Chomsky's 'alphabet of symbols' and shape grammar's 'alphabet of shapes' (Stiny 1975: 28). Stiny specifically links shape grammar's Euclidean transformations, that is: '*translation, rotation, reflection, scale*, or finite *compositions* of them' (Stiny 1980: 344) with Chomsky's position that 'the syntactic component of a generative grammar contains a *transformational* subcomponent' (Chomsky 1969: 17). In effect Stiny is proposing that the constituent parts of shape grammar are shapes, the syntax is the rules set of Euclidean transformations, and the meaning is good design. Working across disciplines, Stiny intended his work to be relevant and interesting to artists as well as to scientists and grammarians (1975: 2). Stiny was instrumental in establishing 'the formal machinery for the algorithmic definition of languages of two- and three-dimensional spatial design' (1980: 343) using the concept of transformations of shapes through the Euclidean processes.

Shape grammar evolved as having two functions: to analyse an existing entity (painting, sculpture, building, or product), and to generate (design) new entities. Much of the early work in the field was analytical, particularly work in the field of architecture which, being based on clear visual forms, lends itself to investigation by shape grammar. One key example is the Renaissance architecture of Palladio with its *construction grammar* (Sass 2007) based on the Golden Section[9]. Because Palladio describes his work and its rationale in great detail in his *Quattro Libri dell'Architectture* (*The Four Books on Architecture)* (1570) shape grammarians have found it open to analysis. Stiny himself examined the grammar of Palladian buildings (Stiny & Mitchell 1978), as did Shin (1996), March (1999) and Sass (2007). Other analytical applications of shape grammar in architecture include grammars of the Japanese teahouse (Knight 1981b), Wren's City church designs (Buelinckx 1993a), traditional Turkish houses (Cagdas 1996a), and the windows of Frank Lloyd Wright's buildings (Rollo 1995). Mayall and Hall's (2005;

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[9] "The Greeks recognised the dominating role the Golden Section played in the proportioning of the human body. Believing that both man and his temples should belong to a higher order, these same proportions were reflected in temple structures. [...] A rectangle whose sides are proportioned according to the Golden Section is known as a Golden Rectangle. If a square is constructed on its smaller side, the remaining portion of the original rectangle would be a smaller but similar Golden Rectangle. This operation can be repeated indefinitely to create a gradation of squares and Golden Rectangles. During this transformation, each part remains similar to all of the other parts, as well as to the whole." Ching (1979: 300-301)

2007) work on landscape grammar, on the other hand, is generative in that it takes a pre-existing vocabulary of landscape-related features and uses algorithms to design an entirely new landscape. Because shape grammars have their roots in Euclidean transformations (translation, rotation, reflection, scale, or compositions) one outcome of the generative aspect of shape grammar has been computer-aided design (CAD)[10] (Eastman 1991). Shape grammars, with and without CAD, have now extended into non-architectural fields such as manufacturing (Brown, McMahon & Sims 1994; Ertelt et al 2009), the design branding of cars and motorcycles (Pugliese & Cagan 2002; McCormack & Cagan 2004) and product development (Agarwal & Cagan 1998). The study of shape grammars themselves (Halliday & Matthiessen 1999) forms a large part of the literature of this field (Stiny 1985; Stouffs 1994; Wells 1994; Tapia 1996; Li 1998; Knight 1999 among others).

Four key papers provide an overview of shape grammars. Firstly Knight (1999) explores six different types of shape grammars (basic grammar, non-deterministic basic grammar, sequential grammar, additive grammar, deterministic grammar and unrestricted grammar), seeing them as ways in which given shapes can be algorithmically built in two- or three-dimensions. He brings forward Chomsky's work and builds much of his own thinking upon it, particularly in setting out the relationship between the six identified types of shape grammar and the respective restrictions within the rules (or, using linguistic terminology, their syntax) of each. Knight does, however, caution against forcing affinities between shape and symbolic grammars as they are 'significantly different' (Knight 1999:16). He sets out the 'practical use of shape grammars in design projects where specific goals and constraints need to be satisfied' (1999: 15). His companion paper (1999) explores the practical application of the different types of shape grammars and the questions that their application raises. Next, a further application of shape grammar can be seen in Mayall & Hall's work on the formalisation of a landscape grammar, and its application in the design of a residential neighbourhood in Bermuda. The work is published in two papers: the first (2005) presents the concept of 'a spatial landscape grammar'; and the second (2007) describes how the concept was developed within a software environment and applied to the residential neighbourhood in question. Mayall & Hall position their work in two ways.

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[10] CAD has since diverged from its origins in shape grammar and its understanding that, by using computers, algorithms can be applied to design through digital language. Whole programming languages are based on this and many other digital formats use programming language which derives from simple syntax-neutral English.

Firstly, in terms of 'language-landscape metaphor' (2005: 896) that is, where language and its structure is used as a metaphor for the elements of landscape and how they fit together, and secondly in terms of 'the use of a generative and interpretive production system and modern computing technology' (2005: 895). This duality is never fully resolved, but the computer programme resulting from their work and the outputs of the programme suggest that they have indeed created a discrete grammar of landscape. Mayall & Hall follow Chomsky's rule set: IF [precondition] THEN [consequent], substituting for the linguistic vocabulary of constituent parts (phonemes and morphemes) a vocabulary of landscape objects (reference Stiny's position that shape grammar replaces the 'alphabet of symbols' with 'an alphabet of shapes'). They position their work not as an analytical grammar which 'would seek to deconstruct a landscape' against pre-set criteria, but rather as a generative grammar which 'constructs a simulated landscape according to a specific desired character' (2005: 897), thus defining the difference between the two approaches. The formal structure of a landscape grammar is defined in terms of 'its vocabulary of object types; its sets of rules, each containing a precondition and a consequent; and as a scene of landscape objects' (2005: 909).

Finally, Space Syntax (Hillier & Hanson 1984; Hillier 1996) is not a generative grammar in the sense of creating new entities from constituent parts, but is, instead, a valuable descriptive and analytical tool (Steadman 2004). It uses the syntactic elements of *axial lines* drawn through the space between building walls (external and internal) and *isovists* (lines of sight) to analyse the movement of traffic (people and vehicles) through the open spaces created by those walls. Observing 'the pattern of movement and stasis [...and the] integration values of axial lines' (Hillier (1996: 252) within a bounded space, Space Syntax is able to predict how those spaces are likely to be used. As Steadman (2004: 484) puts it: 'What is original to space syntax is the important insight that the pattern of movement in a city or urban area is likely to be shaped to an extent by the topology of its route network alone, irrespective of all other factors above all the distribution of land uses that can be expected to affect traffic'. Hillier's proposition that 'there are relationships, then, between the formal describability of space and how people use it' (1996: 154) informs the development of the grammar of creative workplaces in Chapter 7.

Stiny and Gips' (1972) paper and subsequent work on shape grammars are important to this present study. They build on Chomsky's theory of neutral syntax and develop the

central idea of a syntactic structure of visuospatial grammar using algorithms to govern the assembly of shapes in a meaningful way.

2.4.3   Meaning and its literature as pertaining to the grammar of creative workplaces

As described above in Section 2.4.2, visuospatial grammars, like linguistic grammars, have three elements: lexis, syntax and meaning.   The literature on the lexis of the grammar of creative workplaces is described in detail in Chapter 5, Section 5.3.3.1 (pages 114-118), and that of its syntax is looked at in the earlier section on creative processes (Section 2.3.3 pages 15-18).   This section sets out the literature on meaning in the context of this study.

Meaning in the context of this study has two aspects: denotative (descriptive) and connotative (affective) (Ching 1979).   The denotative meaning of the grammar of creative workplaces is that the workplace contains those physical elements that support creative behaviour.   The connotative meaning of the grammar of creative workplaces is that the workplace engenders 'associative values and symbolic content that is subject to personal and cultural interpretation' (Ching 1979: 386), for example users' feelings of safety and permission described in Chapter 5, Section 5.4 pages 136-137.   Stiny is ascribing denotative meaning when he says: 'Our view of meaning in architecture is straightforward: we say what designs mean when we describe them' (Stiny 1985: 14). Although meaning is irrelevant to grammaticality in Chomsky's (linguistic) generative grammar it has, however, been present in shape grammar to some small degree from its inception.   The last two sections of Stiny & Gips' 1972 paper are *aesthetics* and *design*: 'We believe that painting and sculpture that have a high visual complexity which does not totally obscure an underlying specificational simplicity make for good art objects' (Stiny & Gips 1972:134).   Stiny & Gips use aesthetic formulae rather than a philosophic approach, quoting Birkhoff's *Aesthetic measure* (1932) and Eysenck's *The Empirical Determination of an Aesthetic Formula* (1941).   They therefore posit that the outcome of shape grammars is 'art objects with specificational simplicity and visual complexity [...] which would be difficult to design by other means' (Stiny & Gips 1972:134).   In his initial shape grammar work (Stiny & Gips1972; Stiny1975) Stiny focused on the recursive generation of shapes.   He later defined meaning as 'systems of categories' which architects use to 'grasp things and to fix their aspects and properties' (Stiny 1985: 14). These categories can be taken from 'science, technology, economics, psychology, sociology, politics, law, history, and aesthetics...and still there is firmness, commodity,

and delight' (Stiny 1985: 15). In 2006 Stiny leads the reader from an introductory statement that 'meaningless units of equal length remain the lone choice [of generative grammar]' (Stiny 2006: 28); through his assertion that 'the shapes that count [...] are the ones there when I calculate. I have to see something and do something for things to have any meaning' (Stiny 2006: 228) to his conclusion that:

> Simply being generative (recursive) [...] in the way Chomsky [...] urge[s], doesn't include everything that experience holds. [...] Shapes and rules – shape grammars – are as creative as words and rules, and then more so. Parts change freely as rules are tried [...]. There is no final vocabulary – meaning is renewed whenever I chose to look again. This is calculating by seeing, and it includes design. (Stiny 2006: 310)

Stiny adds: 'once you're used to meaning, the habit is hard to break' (Stiny 2006: 28). Stiny's inclusion of meaning as a key component of a visual language's grammaticality is important to this study, setting a precedent for denotative and connotative meaning as an integral element of the grammar of creative workplaces.

Although separated by almost 400 years, the architects Le Corbusier (1923) and Palladio (1570) both indicate connotative meaning by the word *beauty*, echoing Stiny's (1985) use of the word 'delight':

> Beauty will result from the form and correspondence of the whole, with respect to the several parts, of the parts with regard to each other; of these again to the whole; that the structure may appear an entire and complete body, wherein each member agrees with the other, and all necessary to compose what you intend to form. (Palladio,1570/1738 quoted Ching 1979: 314).

> You employ stone, wood, and concrete, and with these materials you build houses and palaces. That is construction. Ingenuity is at work. But suddenly you touch my heart, you do me good. I am happy and I say: 'This is beautiful.' That is architecture. Art enters in. (Le Corbusier *Vers une Architecture*, 1923/2007, quoted Ching, 1979: 387).

The connotative meaning inherent in how a building affects the feelings of the people using it is explored by Alexander et al (1977), Alexander (1979) and Pallasmaa (2005). Thus the question arose of how to design buildings that were capable of generating life (Alexander 1979: xii) and that articulate the experiences of being-in-the-world and strengthen our sense of reality and self (Pallasmaa 2005: 11).

The research findings in Chapter 5 suggest that, for respondents, connotative meaning is found in the physical workplace when the physical press enables each person's

individual creative footprint. Creative and psychological meaning converge with architectural meaning in Alexander's (1979) pattern language and in Csikszentmihalyi's (1975) theory of *flow*. Both describe the sense of 'optimal experience' (Csikszentmihalyi 1996: 110); of being 'fully alive' (Alexander 1979: x):

> There is a central quality which is the root criterion of life and spirit in a man, a town, a building or a wilderness [...] The search which we make for this quality, in our own lives, is the central search of any person [...] It is the search for those moments and situations when we are most alive. (Alexander 1979: ix-x)

> This optimal experience is what I have called *flow* because many of the respondents described the feeling when things were going well as an almost automatic, effortless, yet highly focused state of consciousness. (Csikszentmihalyi 1996: 110)

It can be posited that Csikszentmihalyi, Alexander and Pallasmaa are each putting forward an interpretation of meaning as centring on the sensation of being (fully) alive. That meaningfulness of life or of activity is engendered in part by the physical environment and its capacity to support users in the task they are doing.

> Significant architecture makes us experience ourselves as complete embodied and spiritual beings. In fact, this is the great function of all meaningful art. (Pallasmaa 2005:11)

Meaning as ascribed to the workplace in the literature of organisational psychology is largely performance-orientated (e.g. Amabile 1983, 1996; Brill, Margulis & Kronar 1984; Austin, Beaven, Warburton, & Whitley; Clements-Croome & Baizhan 2000; Hameed & Amjad 2009). In this thesis, however, meaning is held to be the extent to which a workplace actively stimulates and sustains the individual and group creativity of the people who use it. Issues of performance in areas other than creativity are not directly considered in this study.

A key element of the grammar of creative workplaces is its lexis. As explored in Chapter 5, the senses are a central part of the grammar's lexis. The literature pertaining to the senses is reviewed in that chapter as it relates to the study, that is, to the interaction between physical press and people's creativity in the workplace.

2.5   Conclusions

The first part of the literature review (Sections 2.2 pages 15-18 and 2.3 pages 12-29) has been a fascinating and frustrating search for work on the direct and indirect effect of physical space on people's ability to be individually or collectively creative. It started in

creativity research where the first three of the four Ps (people, process and product) are covered extensively, but where the fourth P (press, or environment) is used almost exclusively in the anthropological sense of social environment. This led into the sub-field of the social psychology of creativity where again, with the exception of passing references to physical space by Harrington (1990) and Csikszentmihalyi (1996), all references to environment and space were made in social or anthropological contexts, and few direct or indirect references to any link between creativity and physical space were found. Franck's 'ghost of physical determinism' (1984) is apparent in mainstream and environmental psychology. It is arguable that concerns over physical determinism impact, consciously or unconsciously, how researchers interpret those findings that touch upon it. Commentary in creativity psychology is contradictory or evasive: the literature mentions the physical environment and individual writers have opinions on it, but they either step back (Amabile, 1983/96; Harrington, 1990) or dismiss it (Csikszentmihalyi, 1988, 1996). Csikszentmihalyi (1996) is voicing an unsubstantiated opinion when he says that not only is there no evidence for the idea that there is a link between physical environment and creativity, but there most likely never will be. And yet at the same time these researchers (Amabile, 1983/96; Csikszentmihalyi, 1996; Harrington, 1990) recommend that society should build physical environments that support creative growth.

The fields of visual perception and design psychology introduced the concept of affordances, and architecture with the work of Alexander et al (1977/1979) and Hillier & Hanson (1984) was explored. Spanning architectural and environmental psychology, Franck's work on physical determinism has been central in identifying a possible cause for the dearth of literature on creativity and the physical environment.

Finally, in the field of creativity and innovation management researchers have been exploring the links between physical space and innovation or future thinking, spurred by the economic necessity to create workplaces that actively encourage and support creativity. The relevant papers in this field examine the different conceptual bases informing the design and management of the creative work space case studies. They demonstrate a diversity of material and conclusions, reflecting the range of disciplines from which their authors come: marketing, industrial design engineering, business management, ergonomics, Human Resources and innovation and design management. All of these papers conclude that there is a need for further work on the principles underpinning the design, management and evaluation of physical environments

specifically designed to support innovation and creative thinking: the area on which this research directly focuses.

The literature review has revealed a growing interest in researching the impact of the physical press on workplace creativity. It brings to light, however, the lack of underlying principles that might inform a structured approach across disciplines. The design of 'future' spaces and of day-to-day workplaces is not as yet informed by a systematic or best practice approach. Because the field is new and the literature emergent, workplaces are rarely designed using systematic research into which aspects of physical spaces enhance creativity, or strategic input about the business needs of the organisation. In the same way, there is no agreed set of evaluation criteria of such spaces. This lack of fundamental theory is what this thesis seeks to address.

The second part of the literature review has examined the literature on linguistic and visuospatial grammars, and on meaning as inherent to grammaticality within this study. The line has been followed from Chomsky's (1957) linguistics work on generative syntax-neutral grammar to the emergence of shape grammars (Stiny & Gips 1972; Stiny 1985, 2006; Knight 1999) and the broader field of visuospatial grammars (among others Knight 1981b; Buelinckx 1993a; Mayall & Hall 2005, 2007; Sass 2007). The literature on connotative meaning in the physical environment is examined in the disciplines of architecture (Palladio 1570/1738; Le Corbusier 1923/2007; Alexander 1979; Pallasmaa 2005); shape grammars (Stiny & Gips 1972; Stiny 2006; Sass 2007); and creativity research (Csikszentmihalyi 1988). The two main approaches to connotative meaning in the literature, beauty and aliveness, are not seen as mutually exclusive but rather as complementary. Chapter 5 describes the importance of the sense of aliveness to this study's research respondents' workplace creativity.

The research question posed at the start of this research sought to discover whether or not there was a link between the physical workplace and users' creativity. The aim of the question was to explore the impact (if any) of physical press upon people's ability to be creative in the workplace. In reviewing the literature of creativity and innovation management that link has been demonstrated. Therefore the initial aim of the research is to explore this link and test whether it can be verified.

The second research question has emerged from the literature: are there discrete elements within the physical environment of the workplace that impact upon people's

ability to exercise their small-c creativity (Simonton 2005, Richards 2010) in the workplace and if so, can they be identified?

A further aim has been to discover whether these possible elements can be codified and used to inform the design of new workplaces and evaluate existing workplaces for their capacity to support and stimulate small-c creativity. While there are examples in the literature (Plucker & Makel 2010) of how an individual's creativity can be evaluated through personality scales (Hall & MacKinnon 1969), creative activities (for example, the Creative Achievement Questionnaire: Carson, Peterson & Higgins 2005) and attitudes (Beghetto 2006), and how the effect of social press or environment on creativity at work can be assessed (including Amabile, Conti, Coon, Lazenby & Herron 1996; Hunter, Bedell & Mumford 2007), the researcher has been unable to discover an evaluation method that exclusively focuses on the interrelationship of the physical environment and creativity.

Everyday small-c creativity rather than middle-to-big-C creativity is the focus of this research, situated in the physical workplace rather than virtual or electronic environments. The research aims to address a gap in knowledge about small-c workplace creativity, the impact that the physical environment might have on it, and the identity of the particular elements that create that impact. The research objectives are to identify and codify those elements, and create a framework that enables their application within workplaces.

In this chapter the pertinent literature of linguistic and visuospatial grammars, and of creativity within the fields of creativity research, creativity and innovation management, architecture, environment and planning and their psychologies has been reviewed. In the next chapter the issue of physical determinism is explored, seeking to establish whether it is a possible reason for the small amount of research done on the physical environment-creativity link, and if so, how the issue might best be addressed.

Chapter 3: Interaction Model of Creative Behaviour

3.1 Introduction

Chapter 2, in its review of the literatures of creativity research, architectural and environmental psychology, architecture and design, and creativity and innovation management, found that it is possible to posit that 'diverse disciples' acknowledge a link between physical work environment and creativity (McCoy 2005: 170). This assertion is based on three bodies of work: firstly that by McCoy (2000) and McCoy & Evans (2002) establishing that the physical environment can be said to impact team performance in the workplace, including creative behaviour: 'Satisfaction with job and environment will influence work performance. Creativity and innovation will be measures of performance' (McCoy & Evans 2002: 457). Secondly the body of work published in *Creativity and Innovation Management* (Kristensen 2004, Lewis & Moultrie 2005, Haner 2005, Moultrie et al 2007, van der Lugt et al 2007) establishes a link between levels of creative behaviour and the spaces within which that behaviour takes place. Finally work by Dul & Ceylan (2011) and Dul et al (2011) lists elements of the physical and social environment that impact creativity in the workplace. At the same time the review found that researchers, particularly in the field of creativity research, have stopped short of exploring the physical environment/creativity link despite strong indications from research subjects that they find it important.

This chapter examines this unexpected dearth of research and proposes physical determinism as a possible reason for creativity researchers' reluctance to tackle the physical environment/creativity link. The chapter then suggests an approach to the issue, leading to a potential resolution of the question of physical determinism using a mediated approach. This is then specified in an interaction model of creative behaviour. The model, built upon work by Franck (1984), is set out in detail. It is then related to parallel models proposed by McCoy (2000) and (Dul & Ceylan 2011). Finally it is tested against the data emerging from the research stages.

3.2 Physical Determinism: An overview

Csikszentmihalyi's argument that no evidence exists to prove that creativity can be brought about by an agreeable location (1996) can be read as a rebuttal (conscious or unconscious) of physical determinism: the idea that the physical environment is the

predominating factor in human behaviour. Determinism theorises that single factors or groups of factors predominate in affecting human behaviour. Geographical determinism claims this predominating influence for the natural environment (Lewthwaite 1966; Pries 2001) and architectural determinism claims it for the built environment (Brandt 2003) where people's behaviour is said to be directly influenced by the constructed spaces they inhabit. Within the terms of this research, physical determinism is the theory that the built and the natural environments, taken together, have a predominating effect on the people inhabiting and using them and predominantly influence inhabitants' behaviour. The concept of physical determinism continues to be influential despite cogent critique (Franck 1984) (see Chapter 2, page 24) and strong counter-arguments (Broady, 1966; Bailey, 1975; Marmot, 2002 among others). Andersson & Musterd say: 'It is not exceptional for policy makers to believe in physical determinism and use the instrument of physical restructuring to resolve social problems' (2005:151) and this is echoed by Toker & Toker (2006) who use the phrase *spatial determinism* to describe the claims that, when embedded in new urbanism, the right kind of design if applied to American cities could impose a new order of societal morality. As Pries counters: 'rethinking the relation between the social and the (geographic) space [does] not represent an attempt to advocate a primitive geo-determinism' (2001: 29).

Determinism is often unconscious. Broady says: 'Architects [...] are apt to subscribe to a [...] fundamental and pervasive kind of theorizing which may be labelled "architectural determinism". It is more often found implicit in architects' thinking than in any clearly argued form' (Broady 1966 quoted in Gutman 1987: 173). Van der Lugt et al (2006), whose work on future thinking spaces is examined in the literature review, display an implicit determinism when, in contrasting the types of ideas generated in different kinds of rooms in one of their case study facilities, they say:

> Participants [in the scenario rooms] experience time and time again that the set-up of the different rooms strongly affects the group behaviour. For instance, users of the 'Rules and Regulations' scenario room tend to come up with all sorts of strongly structured solutions to their problem, whereas the 'Community' scenario room evokes more free ways of thinking. (2006: 76)

Van der Lugt et al's deterministic assumptions are evident in they do not examine other variables. Participants' choice of the room they used, what may have influenced that choice, or what their innate preferences might have been in terms of, for example Kirton's (2003) adaptor-innovator scale, are not considered.

The term physical determinism has a much wider range of meaning than simply that of the built and natural environment's impact on human behaviour. Both philosophy and quantum physics, for example, use the term in domain-specific ways which are outside the terms of this study. The environmental meaning can also be expressed differently: the term spatial determinism seen above (Toker & Toker 2006) appears in the field of environment and planning and expresses the same concept of determinism from the perspective of spatial rather than environmental awareness.

It is the predominant influence claim of the determinist approach which may lie at the heart of creativity researchers' reluctance to draw a direct link between creative behaviour and place. In her review of the literature linking the physical work environment to creative context McCoy states:

> Much significant and important research discusses the context of creativity as the psychological and social environment, but it stops short of considering the physical environment as creative context. Similarly, many fascinating studies have shown that the physical components of an office influence team performance and environmental satisfaction, but they stop short of defining performance in terms of creativity or specifically investigating the influence of the physical environment on creativity of teams. (2005: 170)

McCoy's conclusion parallels the conclusion of the literature review that press, the fourth P of creativity (people, process, product, and press) is predominantly seen in terms of the social environment and only tangentially as the physical environment within which creativity occurs.

3.3 Addressing the issue of physical determinism

It could be posited that everyone is a physical determinist, in that the physical environment does exert an influence on everyone within it. As Franck says, we are all determinists to the extent that we acknowledge that the environment does exert influence on behaviour in some circumstances (1984: 416). Determinism, however, states that the physical environment is the predominant influence on behaviour, not one of many. The issue starts to resolve when looked at through the lens of Franck's approach to the problem of physical determinism. In her paper *Exorcising the Ghost of Physical Determinism* (1984) she examines the reluctance felt by some researchers to accept the physical determinists' position that the physical environment directly affects behaviour. Franck maintains that researchers are, as she puts it, haunted by the ghost of physical determinism, by the difficulty of positing that apart from an instinctive reaction

to a natural disaster – we run from a tsunami or take shelter in a hurricane – the physical environment directly affects behaviour. She is not alone, and quotes Gans (1968) and Moos (1976) who each take the physical determinists to task for their assumption of direct, unmediated effects of the environment on behaviour (Franck 1984).

It is not surprising, given the determinist position, that the creativity research community has been reluctant to address this area. Franck (1984) argues that what has been missing is a way of mediating the link, and puts forward models (see Figures 2 and 3) that do so.

Environmental feature or event → Behaviour

Other influences → Behaviour

→ Intervening variables
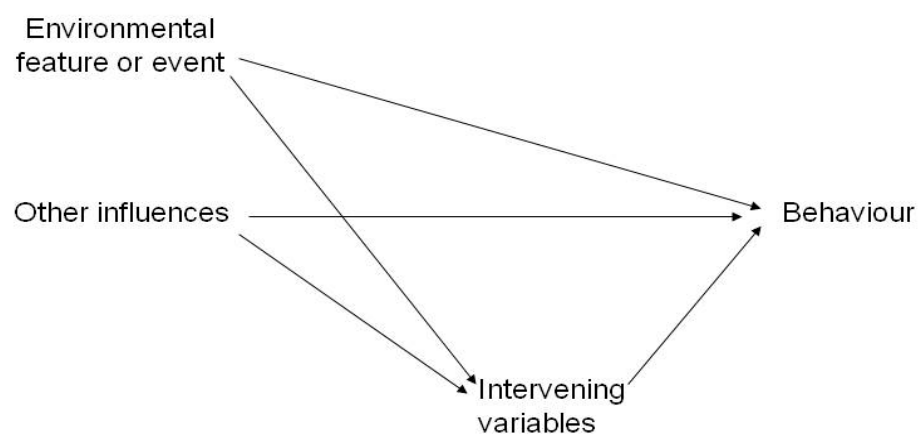
Direct and Indirect Effects of Environment on Behaviour
Karen A. Franck (1984): Exorcising the Ghost of Physical Determinism

Figure 2: Direct and indirect effects of environment on behaviour (reproduced with kind permission of the author)

Franck posits two different types of effects that the physical environment can have on behaviour – *indirect* and *interaction*. Using the example of an office of a particular size and type of furnishing (e.g. a large office with expensive furnishings) that affects a visitor's behaviour, inducing nervousness and an inability to think clearly, she posits an indirect effect (see Figure 2 above) of the physical environment on behaviour. In the example she gives, an independent variable (the physical environment) has an effect on an outcome variable (behaviour) when transmitted via an intervening variable (the visitor's judgement of the status of the office occupant). She concludes: 'When researchers or theorists are criticised for considering only direct effects of environment

on behaviour, it is the absence of such intervening variables that is the issue' (1984: 418).

Franck then introduces a further model of an *interaction* effect of the physical environment on behaviour (Figure 3).

Environmental feature or event

Other influences

Environmental feature or event x other influence

Behaviour

Intervening variables

Figure 3: Interaction effects of environment on behaviour (reproduced with kind permission of the author)

Franck sees interaction effects as 'quite different' from indirect effects. Here combinations of independent variables interact with each other to affect the intervening and hence the outcome variables (a physical environment, she suggests, may have a different effect on behaviour depending on the users' age, sex, background, culture and so forth) and will also vary depending on the value or weighting placed on the independent variables by either the people or the organisations involved. Returning to the example of the office: if one of the independent variables is the visitor's cultural background so that she is not in any way intimidated by the size of the office and the luxury of its furnishings, this will reduce the weighting of the environmental feature. The visitor's feelings, judgement and hence her outcome behaviour will be then be different from that of another visitor with a different cultural background who finds himself feeling and behaving nervously.

Thus Franck posits that there is indeed a link between the physical environment and behaviour, but that far from having a direct or determinist effect, the effect is either indirect or interactive, mediated by intervening variables and affected by the value of weighting ascribed by the organization to the independent variables.

3.4 Resolving the dilemma: The interaction model of creative behaviour

Building on Franck's (1984) models (Figures 2 and 3 above) a key contribution of this thesis is the interaction model of creative behaviour (Figure 4). The model offers an explanation of the nature of the link between physical space and creative behaviour in the workplace.

The interaction model of creative behaviour (Figure 4) takes Franck's position that any observable effect of the physical environment on behaviour must be a mediated one, and posits what that mediating factor might be. The model proposes three independent variables that contribute to workplace creativity: people, social press and physical press, and examines how they interact with each other. It then looks at how this interaction might create an intervening variable or mediating factor, and proposes perception as that factor. The model then posits that from this mediation of the three independent variables arise the dependent variable of creative behaviour and outcome variable of creative product.

The interaction model of creative behaviour (Figure 4), therefore, proposes that creative products develop from people's creative behaviours or processes, which in turn are made possible (or inhibited) by how those people perceive the environment within which they are working. This perception arises from the interaction between people's own skills and personality, the physical environment they work in, and the social or managerial culture of the organisation. Each of these three variables is weighted by the value that the organisation accords them.

The elements of the interaction model of creative behaviour are each examined in turn. These elements are: a) the independent variables of people, social press and physical press; b) their value or weighting ascribed by the organisation and how this influences their interaction; c) the intervening variable of perception; and d) the dependent variables of creative behaviour or process, and creative outcome.
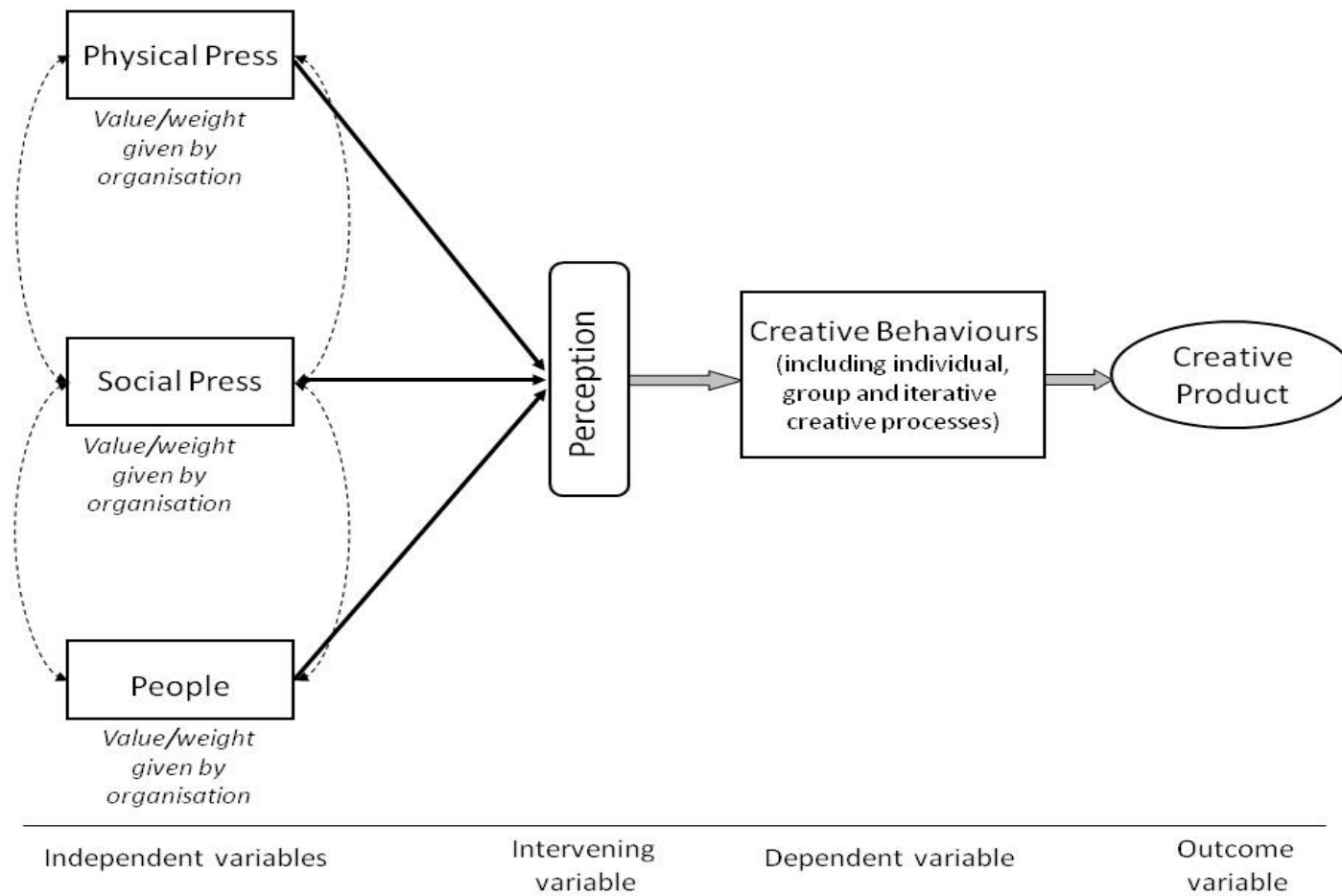
Figure 4: The interaction model of creative behaviour

The creativity research community has identified the principal aspects of creativity as people, process, product and press or the four Ps (Rhodes, 1961; Mouchiroud & Lubart, 2006), and these four aspects also emerge as data categories from the research interviews, focus group and case studies. As well as being present in the literature, the four Ps are present in the elements of the interaction model of creative behaviour.

The model is described from right to left, tracing the creative product back to its origins in the independent variables. The following sections describe first, the outcome variable of creative product; next, the dependent variable of creative behaviours, then the intervening or mediating variable of perception, and finally the independent variables of people, social press and physical press.

3.4.1   Outcome Variable: Creative Product

The goal of a creative process is a realised creative product (McKinnon 1962). In the interaction model of creative behaviour, the creative product is positioned as the model's outcome. This was borne out by the research interviews in which respondents described their creative outcome variously as "product", "the specific thing you're working on", "we have an objective" and with a focus "to generate and stabilise [company] income." This accords with the literature's definition of creative outcomes as being useful and novel (Mayer 1999) or statistically infrequent (MacKinnon 1962), being situated in reality with a recognisable goal, and a sustained development of the original idea (MacKinnon 1962).

3.4.2.   Dependent Variable: Creative Behaviour (Process)

In the interaction model of creative behaviour, creative behaviour is described in terms of different types of creative process. As has been suggested in Chapter 2, three types of creative process are present in the literature: individual (among which Wallas, 1926; Evans & Russell 1989; Csikszentmihalyi 1996), group (Tatsuno 1990) and iterative (Sawyer 2003; Resnick 2007). Because the creative process manifests as a set of activities and behaviours that result in a creative outcome ('Ideation as Process' Runco 2010) the interaction model of creative behaviours situates 'creative process' as a dependent variable arising from the intervening (or mediating) variable of 'perception'.

While it might be argued that process, being composed of the strands of individual, group and iterative processes, is implicit in the independent variables of social press (group and iterative creative processes) and people (individual and iterative creative

processes), process is positioned, rather, as a category of creative behaviours. These categories of behaviours are therefore part of the dependent variable of creative behaviour rather than a component of an independent variable. Again, this was substantiated by interview data where respondents spoke of "support for creativity through planning, empowerment and personal responsibility" and "general use of idea-generating and evaluating tools" within managerial and organisational activities rather than personal ones. Research subjects were also very aware of their own creative processes. Respondents were able to clearly describe their creative process, individual (cognitive) or with others. For example, all thirty-eight respondents to the Case Study 3 survey were able to articulate their creative process. Answers include: "I start by gathering all the information I can about the problem. I would then look to see if I had the knowledge, resources and tools to solve the problem. If not I would then seek the help of others. Diagrams often help to solve the problem or make my thoughts clearer to others" and more briefly: "Put ideas down on paper. Gather information".

3.4.3   *Intervening (mediating) variable: Perception*

Franck identifies perception as an intervening variable and cites Gans' (1968b: 6) stance that an objective environment must be perceived subjectively before it affects behaviour, adding that 'It is more likely that the physical environment affects behaviour even when people are unaware of it' (Franck 1984: 421-422). In stressing the role that perception plays in her model, she quotes Lang:

> Environment can be considered a set of behaviour settings in which the layout provides affordances for physical comfort, activities, and aesthetic appreciation…If the affordances are perceived and there is a predisposition and competence enough to use them among the population concerned, then it becomes an effective environment. (Lang 1980: 151 quoted by Franck 1984: 421-422).

If we can say with Franck (1984) that the physical environment can have an impact on behaviour when mediated by an intervening variable, then we can posit a model that applies Franck's argument to the issue of the impact of the physical environment on people's creativity. In Franck's model the intervening variable mediates between the independent variables and the dependent variable of behaviour. In the interaction model of creative behaviour the intervening variable that emerges from the research findings is perception. This has an effect on the possibility of creative behaviour and on the uptake of affordances in the environment, and therefore on the creative product or outcome.

This study argues that creative behaviour and hence creative product or outcome is mediated by the perception formed by a member of staff of his or her overall work environment (social as well as physical) and by their own personal skills, behaviours and traits.

In this context perception is defined in two ways. The first is as a visual process whereby an object is perceived and the 'invariant combination of [its] properties is "meaningful"' (Gibson 1977: 68). The meaning the perceiver attaches to the object (or objects within a specific environment) is the extent of its capacity to afford behaviour. The data categories of perception speak to how perception impacts on how people see the space in which they are working. The take-up of an affordance is, as Lang (1980) says, often a matter of proficiency.

The second aspect of the intervening (mediating) variable of perception is affect (Russ 1993). This builds on Gans' (1968) insight that subjective perception is essential before the objective environment can affect behaviour. Research by Amabile & Kramer (2011) links creativity to motivation, productivity and what they call 'inner work life' or positive emotions. The argument for visual and affective perception as the intervening variable was supported by data demonstrating how people make different use the same spaces according to their proficiency (Lang 1980) and to their ability to see and read the possible meanings attached to the affordances of the spaces. The supporting data emerged particularly from case study examples such as that of a prototype test (described in full in Chapter 6) where the workspace comprised a single room with seven cubicle workplaces. In it the soft-board panelled walls of five of the six cubicles were almost completely devoid of personal or research material. The other two cubicles, however, were richly populated with research-relevant papers, notes and diagrams as well as some personal references and children's drawings. Two people, therefore, could be said to have perceived those particular affordances of the space and used them, while the other five people had not.

3.5 Independent variables

Three discrete independent variables are posited: people, social press and physical press. As stated, these emerge from the literature of two of the four Ps of creativity (Rhodes 1961; Mouchiroud & Lubart 2006) that is, creative people and press. The other two Ps, product and process, have been established as, respectively, the outcome variable of creative product and the dependent variable of creative behaviour. Within

each independent variable the role of weighting is also discussed. Franck's (1984) model argues that within the independent variables there will be variations of weight or value ascribed to each. The research findings support this view, demonstrating that identical or similar aspects of each of the independent variables are given differing weight in different organisations. It can be argued that the interaction model of creative behaviour posits a value or weighting ascribed to each independent variable by the workplace organisation which impacts on how people within the organisation perceive their environment. This section explores each independent variable and its weighting through the literature and examines ways in which the proposition is supported by the research data.

3.5.1 *Independent variable: People*

As explored in the review of creativity research literature, individual creativity and the creative personality have been the subject of extensive research in the sixty years since Guilford's keynote address to the American Psychological Association (1950). Summarising this wide-ranging research is beyond the scope of this thesis which instead touches on those of the many research approaches that are pertinent, particularly personality and behaviour. The research focus on creative people has varied considerably, from historiometric examinations of creative traits and personality (for example, Cox 1926; Simonton 2010); Csikszentmihalyi's (1996) and Peterson's (2005) work on the paradoxical traits of the creative personality (summarised in Table 2, page 14) in which people are both smart and naive at once, alternate between imagination and fantasy, and a rooted sense of reality, are both rebellious and conservative, playful and disciplined, and so forth; to the considerable work done by Amabile and her collaborators on the creative psychology of motivation, personality and affect, particularly in creativity in the workplace (Amabile 1988; Amabile & Gryskiewicz 1988; Amabile et al 2005). More recently, Feist's *Functional Model of the Creative Personality* (2010) brings together recent biological, cognitive and psychological research in a model in which genetic-epigenetic influences impact upon the characteristics of the brain, in turn influencing cognitive, social, motivational-affective and clinical traits, leading to an outcome of creative thought or behaviour. The position of people as an independent variable is supported by this many-faceted research and by data from the interviews in which categories of personal creativity such as self-awareness, affective needs, and skills for creativity emerged.

Literature pertaining to the weighting of the independent variable of people includes research on a person's degree of capacity for self (intrinsic) motivation for creativity (Amabile 1983/1996; Amabile & Kramer 2011) and for divergent thinking (DT). DT is the ability to generate ideas fluently (the number of ideas generated in response to a particular stimulus), flexibly (reframing or rethinking the use or interpretation of the stimulus), with originality (unusualness of response) and elaboration (going into greater detail with the ideas generated) (Guilford 1968; Torrance 1974; Runco 1999) and is taken as one measure of creativity. Capacity for DT is tested through, among others, the Torrance Tests of Creative Thinking (TTCT) (Torrance 1974). Supporting this proposed weighting, the research data show interviewees reporting a self-motivated desire for learning and communication, weighting positively towards creativity where intrinsic motivation is a key component. For example, Respondent 4, an independent management consultant says, while talking about his motivation and his creative thinking process: "So I get better every day, every week, every year. Sometimes I go back, knowing; but then I regroup, and say: Right, okay, I'm going to start working on what I've learned. How to let go, how to make judgements; but also [I] have to let go."

It can be argued that the independent variable of people is also weighted by the extent to which their personality, traits and abilities support creativity in themselves and others, or is used (consciously or unconsciously) either neutrally or to constrain that creativity. In the data, R2, a Team Leader in a Government department, talks of how she will "ask for advisors to volunteer to become subject matter experts on this particular topic, and then again they will train on it and they will go amongst the teams and roll that out to the advisors". R2's empowering approach supports her team's creativity.

3.5.2 Independent variable: Social Press

The literature on social press, reviewed in Chapter 2, discussed the different approaches to the impact of social press or environment upon creativity. Amabile's (1983/1996) social psychology of creativity argues that an individual's ability to be creative is affected by social (extrinsic) factors as well as personal (intrinsic) ones. The work done by Amabile, Schatzel, Moneta & Kramer (2004) looks particularly at leader behaviours and the impact that perceived leader support has on workplace creativity. They conclude that 'Our data provide suggestive evidence of the proposed mediated sequence whereby leader behaviours precipitate subordinate perceptual and affective reactions, which in turn influence subordinate creative performance' (Amabile et al

2004: 26). Harrington's (1990) ecology of creativity suggests that creativity is an output of a human ecosystem, that is, social press. Inputs such as encouragement, curiosity and exploration (facets of DT) are needed from the ecosystem, that is, from the social environment within which creativity is required. Csikszentmihalyi's (1990) three-part model systems approach sees creativity as a product of the society (field and domain) in which the individual works, as well as a product of an individual mind. The impact of the social environment, including perception of the support for creativity given by managers, on the creativity of the people working in it, can be said to be an independent variable which carries within it the weighting given it by organisations. This is demonstrated by the research done by Amabile et al (2004) in which they conclude:

> Three sources of evidence in this study suggest that negative behaviours might be even more important [than positive ones]. First, reports of negative leader behaviours in our participants' diary narratives were quite common. [...] Second, the qualitative analysis of behavioural categories suggested that affective reactions to negative behaviours may be stronger than those to positive behaviours. Moreover, the negative affective states (usually frustration and anger) seemed to be more specific than the positive states (usually rather diffuse pleasant feelings). Third, the positive behavioural categories contained a number of leader behaviour incidents that were described as the unexpected absence of a negative behaviour or the unexpected alteration of a habitually negative behaviour pattern. (Amabile et al 2004: 28).

Supporting this proposition, the research findings revealed social press as a data category that included a) the need for encouragement, b) the social impact of other people, c) the need for permission from others, and d) creating an environment of safety. The interviewees spoke of how the cultural aspects – the social press – of their respective organisations impacts on their ability to be creative at work, both positively and negatively. Feeling uncomfortable in a space inhibited good work (R6); being permitted to 'dress-down' at strategy events (R10) encouraged participation and creativity. The need to feel safe was particularly evident in interviews with public sector employees, where they either needed to feel safe themselves, or to create an environment within which their staff felt safe. The need for permission from others explores issues with management and social environment, for example "[In a new job] being given, subconsciously, permission to think again" (R1) and "Because I'm not a career civil servant, challenge from me is allowed" (R3).

In Case Study 3 an engineer who used his ten-minute walk between the plant and the office building was at odds with the received wisdom in the company that walking time was 'wasted' time.

> I would definitely use the time to or from the job to think about the next stage. [The efficiency study] see the walking to the job as a complete waste of time. [...] But I definitely did use the thinking time, even in problem-solving. (CS3)

The category of social press contains a list of organisational pressures that interviewees perceived as actively inhibiting their creativity. These include authoritarian management style, constrained autonomy, time pressures and interpersonal personality issues. This accords with McCoy's (2000) observation that less creative teams were actively constrained from developing their creativity by time and work pressures imposed by their managers.

Social press can thus be posited as an independent variable, susceptible to weighting by the organisation. This weighting contributes to users' perception of their ability to exhibit creative behaviours or to constrain them.

3.5.3 Independent variable: Physical Press

The impact of physical press (Rhodes, 1961; Mouchiroud & Lubart 2006) (environment) on creativity in the workplace is discussed in the literature on the field of creativity and innovation management (McCoy 2000; Kristensen 2004; Lewis & Moultrie 2005; Haner 2005; van der Lugt et al 2007; and Moultrie et al 2007). Looking predominantly at 'Future Centres' (Edvinsson 1997), these papers variously conclude that 'companies can generate more ideas by using the physical space more diligently' (Kristensen 2004: 89) and that 'organisations will need to purposefully address the issue of spatial support to creativity and innovation' (Haner 2005: 296). These spaces are all those 'in which creative activities might take place' (Moultrie et al 2007: 62) as well as designated creativity and innovation spaces that can 'empower people to engage in creative activities, by taking them away from the daily working processes' (van der Lugt 2007: 78) and where 'the physical form of an innovation laboratory is significantly more than an aesthetic issue' (Lewis & Moultrie 2005: 80-81). Working in a standard government department office, McCoy submits that 'a significant relationship does exist between the feature and properties of the physical environment and creative achievement of teams' (2000: 252) and concludes that 'facilities managers may want to reconsider facilities management policies' (McCoy 2000:256).

Physical press as an independent variable is supported by the data, where respondents from the interviews and case studies report a clear link between physical space and its impact (to support or hinder) on their creativity. For example, the Deputy Chief Executive of a small NGO reported: "The silence, and the whole feel of when I go into these [government] buildings, it just knocks me right off [being creative]" (R6). R10, a junior Sales Executive, on the other hand, talked about working days out of the office:

> We had a strategy day round at our boss's boss's house round in her living room. We brought a flipchart, and ate food. And it was a really nice day, and it's got a garden; we sat out on her decking with the flipcharts and she asked questions and [her direct report] filled it out. Then we went off and did a bit of our own thinking, and wrote notes, and came back. We did it for the whole day, and it's great.

It is therefore suggested that the three independent variables of *physical press, social press* and *people* elements have the possibility of interacting with each other, and that their respective value or weight may vary dependent on the importance accorded them by individuals and by the organisation as a whole.

3.6   Two key models of creative behaviour in the workplace

> How space is designed and allocated can unleash the energy, commitment, and creativity of individuals, teams and departments. Organisations that thrive depend on such behaviour. (Kelley & Becker, 2004: 55)

The interaction model of creative behaviour is supported in the literature by the two further models: McCoy (2000) Figure 5 (below) and Dul & Ceylan (2011) Figure 6 (below). McCoy's (2000) study of the relationship between the physical environment and creative teamwork in a US Government agency suggests a set of propositions relating to the interaction between teams of different levels of creativity. McCoy (2000) uses the three categories of *incremental*, *distinctive* and *breakthrough* creativity to differentiate between the creativity levels of the teams studied (as assessed by themselves, their managers and their peers) and their physical work environment. She proposes three key aspects of importance to the creativity of the team: a) control over the physical environment, b) functional opportunity for communication and collaboration, and c) a system of self-expression of shared team focus.

Figure 5: A conceptual model of team achievement in the work environment (reproduced by kind permission of Janetta McCoy)
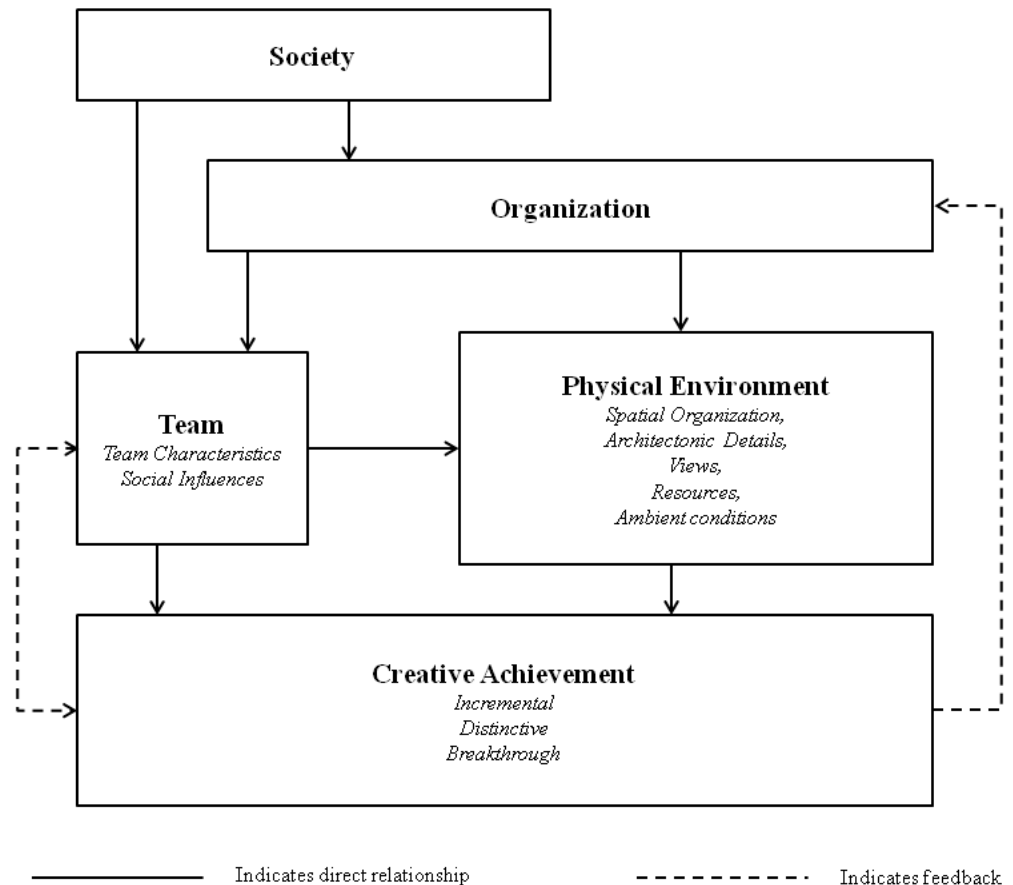
In this model:

1. Society influences attributes of the organization and the team
2. Organization assigns individuals to team membership and constructs the physical environment
3. Unique team attributes establish level of autonomy and motivation
4. Team chooses to control some features of physical environment, activities and methods of functioning
5. Unique team attributes establish communication and collaboration requirements
6. Physical environment provides functional opportunity
7. Physical environment supports focus of activities and artifacts
8. Activities and artifacts provide feedback to the team influencing future decision and behaviours
9. Attributes of the team, their ability to function, and their range of activities directly support creative achievement.

(McCoy 2000: 235)

McCoy suggests a systemic rather than a causal link, calling her model (Figure 5 above) 'A systems model of creative achievement'. In this model McCoy echoes Franck's

(1984) 'mediated effect'. McCoy points out the tension between the team's need to support, enhance and express its creativity in the physical environment, and the needs of the planner, designer or facilities manager 'whose focus is efficiency and cost containment' (2000: 254). 'Higher levels of creativity were associated with the team's autonomy and motivation to achieve the required features and properties of the physical setting. This control includes a willingness to challenge and even circumvent the [...] policies of standards and guidelines governing the physical environment at [the government department]' (McCoy 2000: 242).

McCoy's study demonstrates that the creative achievement of teams is supported by the degree to which those teams are empowered (either by their management or themselves) to adapt their physical environment to their unique needs, enabled to communicate and collaborate freely, and permitted to demonstrate their shared professional focus through the display of team artefacts. Her study also brings forward the extent to which less creative teams were actively hindered in any growth of team creativity by the physical environment and their inability to change it, given the managerial pressures and demands put upon them: 'Incremental [less] Creative teams have physical environments that hinder communication and collaboration [two prerequisites for creativity]' (2000: 242). McCoy's findings also informs the weighting of independent variables, where social press (the organisation) and the skills and traits of the people themselves also play a part in the system.

In their study of the characteristics of work environments that support employee creativity, Dul & Ceylan (2011) look at elements of the socio-organisational context (or social press) of the work environment that actively foster creativity. They list such aspects as having a challenging job, good management that allows for strong teamwork, task rotation, and autonomy, and motivational spurs including creative goals and recognition of creative ideas. They also review literature from ergonomics (Furnham & Strbac 2002; Küller et al 2006), environmental psychology, architecture and other fields to identify elements of the physical environment that foster creativity at work. These include views, light, furniture and indoor plants, and positive smells and sounds (Dul & Ceylan 2011: 14). They propose a relationship, rather than a systemic model (Figure 6):
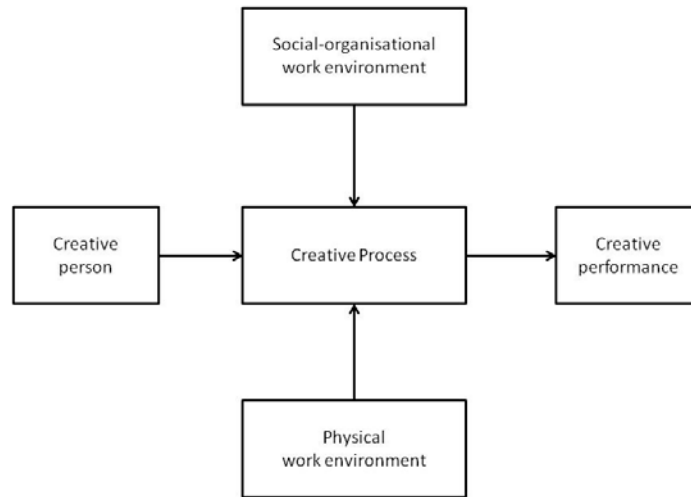
Figure 6: "A conceptual model of the relationships between creative person, creative work environment and creative performance" Dul & Ceylan (2011:13).

Here the creative process is directly influenced by the socio-organisational work environment, the creative individual and the physical work environment; only then does creative performance emerge. These categories relate directly to the interaction model of creative behaviour's independent variables of people, social press and physical press, and to McCoy's society, organisation, team (including non-verbal self-expression and function), and physical features.

Franck's (1984), McCoy's (2000) and Dul & Ceylan's (2011) work all clarify the nature of the link between physical space and behaviour. The research findings from this present study indicate that Franck's 'interaction effect', McCoy's 'interacting sub-systems' and Dul & Ceylan's 'relationships' are germane to the link between physical space and creative behaviour.

3.7 Conclusion

A new interaction model of creative behaviour is proposed in this chapter. The model (Figure 4) has emerged from the literature and is proposed as a response to the issue of physical determinism, the likely reason (Franck 1984) why so little research work has been done on the impact that physical press may have on people's ability to be creative, particularly in the workplace. The interaction model of creative behaviour posits three independent variables: people, social press and physical press. The model asserts that the impact of physical press on creative behaviour is a mediated one in which the three independent variables interact according to their respective weightings (value ascribed to each by the organisation). This interaction can prompt an intervening variable of

perception which in turn affects creative behaviour and so the creative product. Each stage of the development of the argument has been supported by examples from the data, and builds on Franck's (1984) interaction model.

The implications of this chapter are threefold. Firstly, that the link between physical space and creative behaviour in the workplace exists; secondly, because it is a mediated link, organisations cannot expect the physical environment to have a significant impact on creative behaviour without a concomitant organisational commitment to the value ascribed to physical press and to the other two independent variables of people and social press. Finally, that the independent, intervening (mediating) and outcome variables are firmly rooted in the literature. Throughout the chapter each part of the model has been tested against data from the research and its relevance to the study demonstrated.

The interaction model of creative behaviour is important to this thesis. It contributes a further approach to the link between creativity and the physical environment that addresses the hitherto vexed question of physical determinism. In addition, it creates a framework for the research moving forward, encapsulating the underlying meta-structure of the creative process and thus providing a way of organising the research around its focus of creativity in the physical environment. This allows the grammar of creative workplaces to emerge, where the independent variable of physical press can be seen in its relation to those of social press and people. In this way the thesis avoids the possibility of inadvertently reasserting the predominance of the physical environment in the stimulation and support of workplace creativity. The model is referenced throughout the thesis, maintaining the balance between its three independent variables.

Having stated the conceptual model that creates a framework for the research, the next chapter now examines the method devised to collect and analyse the research data. This thesis aims to explore and articulate the impact that the physical environment might have on small-c workplace creativity, and the identity of the particular elements that create that impact. It is in a qualitative enquiry into workplaces and the subjective experience of the people who work in them that these aspects can be further examined.

Chapter 4: Methodology

4.1 Introduction

As seen in the previous chapter's interaction model of creative behaviour, workplaces are complex entities. The differently weighted independent variables of the physical environment, people and their behaviours, and the managerial culture (or social press) of the organisation form a system of interrelationships (Arrow 2000) within which creativity can be both supported and hindered.

This chapter considers the challenges of investigating the subjective experience of space through a rigorous research process that results in the emergence, and subsequent testing, of the central argument of the thesis: that those elements of physical press that enhance the employees' workplace creativity can be identified and codified as a grammar. The scope of this study, set out in the thesis' introduction, defines workplace creativity as small-c, everyday creativity, used primarily in problem-solving to enhance the quality of work life and performance and resulting in ideas which are socially meaningful within the work context (Simonton 2005; Richards 2010). The data for this study are obtained from organisations in which the majority of people work with small-c, everyday creativity (Richards 2010). The examination of big-C creativity as practiced by eminent, highly creative people (Csikszentmihalyi 1996; Simonton 2010) is therefore not part of this study. Where big-C creativity is present in the research sample, as in the advertising company of Case Study 1, the analysis differentiates between the two kinds of creativity.

This chapter first sets out the rationale for constructivist grounded theory (Charmaz 2000) as an underpinning methodology. It argues that the qualitative approach of constructivist grounded theory is the most appropriate methodology for this research, working as it does with the assumption of multiple readings of reality (Charmaz 2000). The chapter then examines the constant comparator analysis method employed within the framework of constructivist grounded theory and its application to research data. The chapter also discusses the study's adaptation of the constant comparator method (Glaser & Strauss 1967) as an iterative process to test findings as they emerge as well as to analyse data as they are collected. The dilemma of 'the researcher in the research' is reflected upon, examining the impact upon the research in both data collection and data

analysis of the researcher's long professional immersion in the field. It considers how this issue can be addressed, proposing that reflexive awareness can clarify and make transparent the ways in which the researcher's deep professional involvement in the field might influence data coding and the identification of emergent categories and theories (Alvesson & Sköldberg, 2000). The influence of the literature (including prior reading) on the grounded theory process (Glaser 1978) is addressed.

This chapter, therefore, consists of two sections: theoretical and applied methodology. The first section (Section 4.2 below) gives an exposition of the methodology chosen and a rationale for the choice of constructivist grounded theory within the ground of qualitative research. The second section (Section 4.3 page 70) sets out the methods chosen and their use within the research.

4.2 Constructivist grounded theory

Qualitative research 'begins with specific observations and moves towards the development of general patterns that emerge from the cases under study' (Rudestam & Newton, 2007: 37). Constructivist grounded theory (Charmaz 2000) takes the framework of grounded theory (Glaser & Strauss 1967) and develops it from its positivist origins to a constructivist position, that is, the proposal that 'knowledge is a compilation of human-made constructions' (Raskin 2002: 4) rather than 'the neutral discovery of an objective truth' (Castelló & Botella 2006: 263). Grounded theory's radical departure from the 'hard' quantitative research practices of the 1960s and 1970s had its basis in symbolic interactionism, a qualitative methodological 'movement' (Alvesson & Sköldberg 2000:12) arising in 20th century American sociology (Mead, 1934; Blumer, 1969). Symbolic interactionism, a term coined by Blumer (1969), posits that people ascribe meaning to how they see other people acting. It proposes that meaning arises from the interaction people have with society and others, and thus influences the way people then act towards others; and that through an interpretive process these meanings are continually modified. Describing society as 'a web of interaction', Stryker (2006: 213) sees the symbolic interactionist view of society as:

> a flow of events involving multiple persons. Just as society emerges from the social process, so do persons: both take on meanings that emerge in and through social interaction. [...] Society and person are two sides of the same coin; neither exists except as they relate to one another.

This perspective parallels the interaction model of creative behaviour set out in the previous chapter where the social press, people and physical press of the workplace are seen as interacting independent variables, each with a value ascribed to it by their organisational context which influences the interaction through the different weightings. Charmaz argues that the grounded theory approach, based as it is in respondents' views of their own empirical worlds, is enriched by the constructivist standpoint that 'assumes the relativism of multiple social realities, recognises the mutual creation of knowledge by the viewer and the viewed, and aims towards interpretive understanding of subjects' meanings (Guba & Lincoln 1994; Schwandt 1994)' (Charmaz 2000: 510). Charmaz aims through her questioning to arrive at a constructed meaning, rather than a positivist truth (Charmaz 2000).

4.2.1   *An overview of method*

Grounded theory departs from a traditional verification research method (where data are collected and analysed to prove or disprove a hypothesis) in that, as Blumer (1969) enjoined, there is no starting hypothesis. Glaser directs the researcher to approach 'an area of interest with <u>no problem</u>. He moves in with the wonderment of what is going on that is an issue and how it is handled' (Glaser: 1992: 22).   Constructivist grounded theory research is, in overview, a series of five iterative steps: simultaneously collecting and analysing data; coding and then categorising the data as they are collected; constructing concepts as the analysis progresses (memo writing); sampling further data to refine the emerging concepts and theoretical ideas; and integrating these concepts within a theoretical framework (Charmaz, 2000: 510, 511).   Analysis starts in parallel with the data collection, coding the data in order to start defining and categorising them. The codes emerge with the data, often given *in vivo* headings using respondents' own words. Pre-existing coding or concepts have to earn their place (Glaser 1978) rather than dictate it.   In the context of this study, for example, the researcher's professional experience, while contributing to the data, is on an equal rather than privileged footing with all the other data. As Charmaz says, as researchers '[we] should interact with our data and pose questions to them while coding them' (2000: 515).

Figure 7 (below) shows a worked example of how the data are coded. The data are collected and analysed from the set of eleven interviews conducted as part of the first stage of this research (see section 4.3 below).
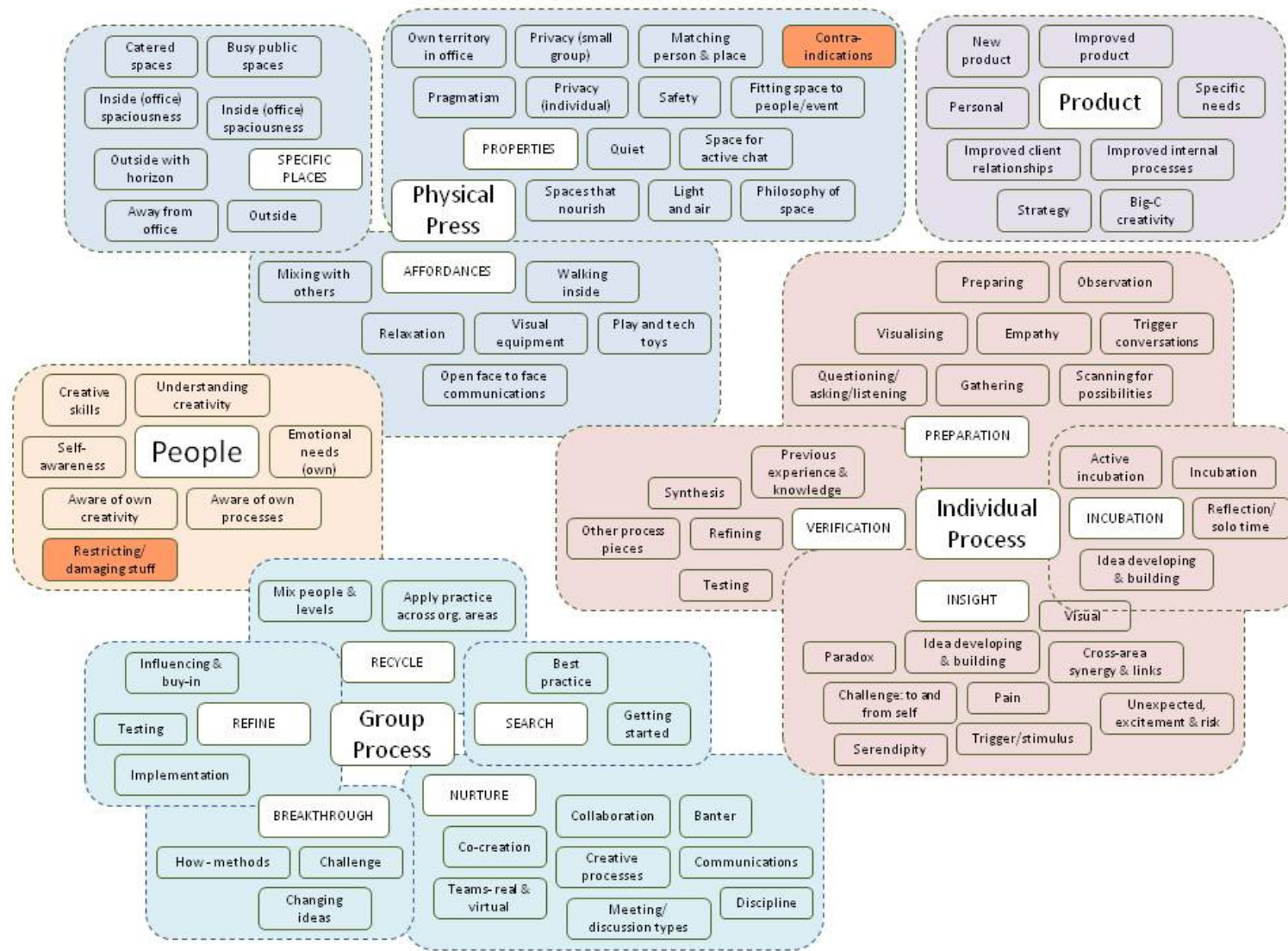
Figure 7: Data categories, subcategories and data groupings from eleven interviews in Stage 1 of the research process

In Figure 7 the core categories are the four Ps of creativity: people, process (individual and group), product and physical press. These four core categories each have a number of subcategories, and each of these has further data groupings.

The subcategories of individual process are preparation, incubation, insight and verification (Wallas 1926), each with their data groupings. The subcategories of group process are recycle, search, nurture, breakthrough and refine (Tatsuno 1990), each with their data groupings. The subcategories of physical press are specific places, properties and affordances, again, each with data groupings. In this example there are no subcategories of people or product, only data groupings. There are also two data groupings (highlighted), one in physical press and the other in people, that contain data about what hinders the creativity of the people interviewed. Each data grouping holds further data. For example, in Table 4 (below) the data grouping of 'gathering' (core category: individual process, subcategory: preparation) contains the following data:

Gathering info Gathering is most important What exists? Been done before? What can I learn? How can I use this? Gathering data inside the office Targeted reading Random reading Different physical locations Ideas now [in software] go and find what you need and glue it together Academic literature Web Common sense – seen through academic theories (MSc work) Reading articles	Rummage in books Rummage on the web Books: I don't read them, I use them. Dip. Rummage on Amazon – what books are there? Books connect to different periods of my career, of time Rummaging adds to the core of my understanding, making sense Rummaging in books in the opposite place Rummaging – going on all the time; fun; just life Art enriches and informs life Art helps you see and understand the principles by which we see the world

Table 4: Data units in the data grouping 'gathering' (core category: individual process, subcategory: preparation)

Each datum in Table 4 is a quotation from the eleven interviews conducted as part of Stage 1 in the research process (examined in depth in Chapter 5). Thus, each of the data groupings across all the subcategories and categories emerging from all areas of the research – interviews, case studies, surveys, focus groups – is informed by similar amounts of data.

In grounded theory a data category is said to be saturated when data from further sources simply repeats existing data. If as the data collection continues data continue to be repeated, the research is said to have reached a point of information redundancy. For example, the data grouping of 'gathering' set out in Table 4 was compiled from the

initial Stage 1 eleven interviews. As the case study data were analysed they deepened this data grouping through repeating data, saturating the data grouping, and finally creating information redundancy.

Grounded theory puts no limits on either the sources from which data can be drawn or the methods of collecting that data. Glaser places great emphasis on the use of triangulation in data collection, arguing that observational data 'is not enough' (Glaser 1992: 49) and that the qualitative methodology of grounded theory can be done with data 'arrived at quantitatively or qualitatively or in some combination' (Glaser 1992: 11). Both Glaser and Charmaz advocate the use of data of 'whatever type' (Glaser 1992: 24) from multiple sources: 'observations, conversations, formal interviews, autobiographies, public records, organisational reports, respondents' diaries and journals, and our own tape-recorded reflections' (Charmaz: 2000: 514). In this study, therefore, constructivist grounded theory approach generates a rich mix of analysable data from multiple sources (including from the researcher's extensive professional experience) and the use of mixed methods. Sandelowski (2008) in clarifying what a mixed method is, uses as an illustrative example studies that employ both interviews and questionnaires. If the interviews and the questionnaires are treated the same with highly structured questions framing the interview then the methods cannot be said to be mixed, but all quantitative. If on the other hand the interviews are 'narratives of the self' then a qualitative-quantitative mix can be claimed. She goes on to relate this to constructivist grounded theory where, rather than being seen as 'an index of some external reality' as it would in grounded theory, the interview is biography and narrative. The varying ways a research interviewer views the respondents, and views the interview data, also influence the interpretive treatment of the interview (Sandowski 2008:306), referring back into Blumer's symbolic interactionism.

4.2.2   The place of literature in the research

In grounded theory (Glaser 1978) the researcher is enjoined not to read any literature that is closely related to the study until towards the end of the data collection and analysis so as not to restrict the coding or prefigure the emergent concepts. Constructivist grounded theory, by contrast, encourages wide reading at all stages of the research.

The influence of the literature has been considerable throughout the research process. It has been greatest in revealing that the initial research focus on the impact of physical

space on workplace creativity had already been established in three bodies of work in particular, the first from McCoy (2000, 2005) and McCoy & Evans (2002); the second a group of papers published in *Creativity and Innovation Management* by Kristensen (2004), Haner (2005), Lewis & Moultrie (2005), Moultrie et al (2007) and Van der Lugt (2007); and the third by Dul & Ceylan (2011) and Dul et al (2011) (as discussed in the literature review). Each of these bodies of work establishes different aspect of the theory that the physical environment of the workplace does indeed impact upon the creativity of its users. Thus the research focus changed from one that had already been established in the field, to an exploration of new data that was emerging from the case studies: elements of an emergent grammar of creative workplaces. In the same way that the constant comparator method of analysis reveals categories of data, so the literature revealed categories of academic interest in the focus on physical press and creativity across a wide range of disciplines (psychology, architecture, architectural and environmental psychologies, and management and innovation studies). Literature examined prior to undertaking the study was predominantly non-academic (Osborn 1953; de Bono 1969, 1971, 1987; Michalko 1998) and although its influence was considerable in a pragmatic context, has proved to have little forward impact on the present study.

4.2.3 *Rationale for using constructivist grounded theory*

This study aims to discover what the relationship between the physical workplace and users' creativity might be, and how that relationship might be codified.

As has been suggested in the exploration of physical determinism in the previous chapter, the research ground is complex. The methodology, therefore, must be at the same time rigorous and able to respond to multiple realities as expressed by research subjects in the workplaces examined. Constructivist grounded theory's interpretive Blumerian (Blumer 1969) approach gives full voice to the research respondents. With its emphasis on meaning (Charmaz 2000) it also enables rich data to contribute meaning through their analysis.

Other qualitative research methods, such as ethnography, are also effective in researching complex communities, facilitating the subjects' voice and using mixed methods data collection. This study uses constructivist grounded theory specifically because its structure, while requiring a rigorous 'fit' with the data (Pidgeon & Henwood 1996), permits initial concepts and findings ('exploratory conceptual and theoretical

development' (Furniss, Blandford & Curzon (2011)) to emerge early in the process and to mature iteratively throughout the course of the study.

4.2.4   Reflexivity: The place of researcher in constructivist grounded theory

A guiding principle of grounded theory is to be able 'to step back or distance oneself from [the data], and then to abstractly conceptualize [them]' (Glaser 1992:11). 'Researchers making themselves accountable to readers are also researchers making themselves accountable to themselves' (Gomm 2008: 293).

This principle is seen as a way of controlling a researcher's urge to include his or her 'pet theoretical code' (Glaser 1992: 28) which forces the data rather than letting the codings emerge. At the same time, Glaser encourages the researcher to bring his or her professional and personal experience and 'in depth knowledge of the data in the area under study' (Glaser 1992:28).   This permits the influence on this research of the researcher's personal experiences in the field to be fully acknowledged.   This professional experience informed the framing of the initial research question that explores the impact (if any) of physical press upon people's ability to be creative in the workplace.   It also informed the subsequent emergence of the second question where, given the finding that physical press does impact upon people's ability to be creative in the workplace, the possibility of identifying and codifying the elements that stimulate and sustain this creativity were examined.   The weight of the researcher's professional experience is balanced with theoretical sensitivity[11] which keeps the researcher from forcing coding and concepts from data which do not, in fact, support them. Charmaz says 'researchers can use grounded theory methods to further their knowledge of subjective experience while neither remaining external from it nor accepting objectivist assumptions and procedures' (2000: 521) adding, 'Line-by-line coding sharpens our use of sensitizing concepts – that is, those background ideas that inform the overall research problem' (2000:515).   Finally Rode (2011) references work by Burawoy (1998) which sets out reflexivity criteria in which intervention becomes an opportunity for data gathering, reflexivity seeks to understand how the quality of the data might be impacted by the data gathering process, and examines how theory is extended by the emergence of structural patterns observed by the reflective practitioner.   '[Reflective researchers]

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[11] Theoretical sensitivity is the process whereby concepts emerge from data and can be related both to universal theoretical models, and to the development of sociological theory (Glaser 1978).

embrace and discuss the idiosyncrasies of unique ethnographic encounters' (Rode, 2011: 124).

It can therefore be argued that reflexivity is an integral part of constructivist grounded theory. It should be present from the start in the researcher's awareness of his or her sensitising concept (Glaser 1992) and the need to hold it at arm's length, as it were, so as not to force coding categories. It should be present in a willingness to continuously explore how the data gathering process impacts the quality of the data, their analysis and emergent theories (Burawoy 1998), and in the exploration of subjective experiences of both the researcher and research subjects.

4.3 The Research Process

4.3.1 Research stages in overview

This section examines each research stage in turn and reflects upon the overall process. As set out in section 4.2 of this chapter, constructivist grounded theory was chosen as this study's preferred methodology, given its ability to work with the multiple realities, complexities and deeply subjective nature of the research's focus on everyday creativity in the workplace (Charmaz 2000; Glaser, 1992). The research is based on concepts to which the researcher's professional practice as a consultant and trainer in organisational creativity had alerted her (Blumer 1969). It is from this professional practice that key data categories and sensitising concepts (Charmaz 2000:515) emerged (explored in detail in Chapter 5).

The research progressed through three consecutive stages (see Table 5 below), each with its aim, its method and subsequent findings. Findings, in the form of interim concepts, emerged at each stage of the research process. As described in the thesis' introduction, the first part of the research is grounded in the researcher's professional practice over the key years 1990 – 2002. During this time an average of eight training sessions were conducted annually, each with up to twelve participants. The data from the professional practice therefore are derived from a sample of over a thousand people. In Stage 1 the original research question – whether physical press impacts on people's creativity in the workplace – was explored through eleven semi-structured interviews and a focus group.

STAGE 1		STAGE 2		STAGE 3	
Aim: • *Data collection and analysis*		*Aims:* • *Verification & refinement of Stage 1 findings* • *Collection & analysis of additional data*		*Aims:* • *Testing the emergent grammar's content, method & accuracy* • *Collection & analysis of additional data*	
Method	**Findings**	**Method**	**Findings**	**Method**	**Findings**
Professional practice	Physical press definition	Three case studies:	Stage 1 findings verified, and some refinements and additions made	Focus group for testing content	Additional elements added
Interviews	Creative footprint	Advertising agency Government dept. Engineering co.		Three studies for testing method	Layout design changed
Focus group			Emergent grammar of creative workplaces		Test scale changed from Likert to semantic differentiation
	Engage/disengage model of creative behaviours				Test method altered
				Two prototype case studies for testing accuracy:	Grammar accurate
				Engineering co. Financial Services	

Table 5: Three-stage research process

The interviews and focus group were conducted to gather data on those aspects of the physical environment that people found both helped and hindered their ability to be creative in the workplace. The collected data were analysed through constructivist grounded theory's constant comparator method and three interim concepts emerged. These were: a definition of physical press, the concept of the creative footprint, and the engage/disengage model of creative behaviours. These findings are presented and discussed in Chapter 5.

In Stage 2 these interim findings were interrogated through a series of three case studies undertaken in separate work environments, also examined in detail in Chapter 5. The work of Yin (2003) informed the design of three case studies, and his accumulative process was adapted (Figure 10 page 79) to respond to the more iterative approach of constructivist grounded theory. In this stage the three interim findings were refined and verified, and the concept of the grammar of creative workplaces emerged.

Stage 3 was undertaken to test the validity and robustness of the emergent grammar of creative workplaces. This was done in three parts: an initial trial of the grammar's components was undertaken with a focus group of graduate students; a test of the grammar's method (how it was designed and the assessment conducted) was undertaken in three research environments in a large US university; lastly the final version of the grammar was tested in two separate open-plan offices, one in Scotland and the other in London.

The research activities, planned in outline and situated within a constructivist framework, developed iteratively in response to the emergent concepts and interim findings. The data emerging from the initial interviews were deemed to need intensive verification and an extension of the sample size, hence the design of three case studies. As the focus of the study shifted from the physical environment/creativity link to the codification of elements in an explicit grammar, so the test phase was introduced. The research's focus moved from "What is the impact (if any) of physical press upon people's ability to be creative in the workplace?" to "Given that physical press impacts upon people's ability to be creative in the workplace, is it possible to identify and codify the elements that stimulate and sustain this creativity?" The change of the research focus during the process sits within the framework of constructivist grounded theory and its continuously emerging concepts.

4.3.2 Sample size and selection

The practice of constructivist grounded theory aims to arrive at rich data in which the categories reach saturation (Onwuegbuzie & Leech 2005). Within the context of this study the aim is to draw external generalisations from the data that are valid beyond the particular sample from which this data is drawn (Maxwell 1992). Maxwell (1992) differentiates between internal and external generalisations, where internal generalisation is the generalisability of conclusions within the group or sample studied and external generalsiation is the generalisability of conclusions into groups other than the one sampled. This necessitates the use of a sample at the larger end of the guidelines on sample size (Creswell 2002; Morse 1994). Recommended sample sizes vary from 25 participants (Charmaz 2006:114); less than 50 people (Ritchie et al 2003:84); 20-30 (Creswell 1998:64); 20 + people (Green & Thoroughgood 2009:120)

Research stage	Activity	No of participants	Surveys	Activity detail
STAGE 1 Data gathering	Professional practice (training groups)	(1000 approx)		Creativity training of small groups within organisations
	Interviews	11 Interviewees		Creative process exploration
	Focus Group	15 members		
STAGE 2 Case Studies	Case Study 1	11 Interviewees	52	(Including one interview with designer) Observation of approx. 100 staff
	Case Study 2	No interviews	21	
	Case Study 3	10 Interviewees	47	(Including one interview with architect) Observation of approx. 100 staff
STAGE 3 Testing	Focus Group	8 members		Assessment of grammar elements
	Method testing 1	2 Interviewees		Independent assessor evaluation
	Method testing 2	Group interview (3 people)		Independent assessor evaluation
	Method testing 3	Group of 8		Researcher observation
	Content testing 1	4 Interviewees	22	Independent assessor evaluation
	Content testing 2	4 Interviewees		Independent assessor evaluation
Totals		**68**	**142**	

Table 6: Sample sizes at each research stage

Sample size should be such that theoretical saturation or informational redundancy is reached (Onwuegbuzie & Leech 2005). At the same time, Guest, Bunce & Johnson's (2006) study found that across a sample size of sixty interviews, category saturation occurred within the first twelve interviews and that the basic elements for core categories (or meta-themes) were present within the first six interviews. Data continued to be added to categories throughout the study and information redundancy occurred in the test (third) stage.

Table 6 (above) shows that in Stage 1, excluding the professional practice, eleven interviews were conducted, and one focus group of fifteen members held. In the three Stage 2 case studies, twenty-one people were interviewed (including one architect and a designer who had been involved in the design of spaces in Case Studies 1 and 3 respectively). 120 people in total responded to the three case study electronic surveys. The case studies involved observation of employee activity in Case Study 1 and Case Study 3, with approximately 100 employees being observed in each company. The test approach is described in full in Section 4.4 page 82. In summary, testing the grammar's content was carried out with a focus group of post-graduate students and faculty in a UK university. Testing the grammar's method was conducted in the US in three academic research environments, with a total of five interviewees, and two assessors of the grammar. Testing the grammar's accuracy was conducted in two UK organisations; four interviews were carried out in each, and there were two assessors of the grammar, one for each organisation.

The large sample size was the source of rich data. Additionally, the wide range of people, hierarchical level, work environment and culture within the sample (discussed below) added to the richness of the data and to the number and subsequent saturation of data categories.

4.3.3 Stage 1: Professional practice, interviews and first focus group

As discussed earlier, the researcher's professional practice of organisational creativity supported organisations across public and private sectors, training staff in the creative thinking techniques needed to tackle problems and issues arising in the course of everyday work. Over the years between 1990 and 2002 the training brought forward remarkably consistent results. The data from these key years are held primarily in a 2002 client report (Appendix 2) underpinning the design of an organisational thinking space.

Eleven research interviews were conducted to ascertain what aspects of the physical work environment people perceived as supporting or hindering their ability to be creative at work. The subjects chosen purposively (Neyman, 1934) from the researcher's large network to ensure as wide a range as possible of different variants. The sectors represented are public, Non-Governmental Organisation (NGO), and private. Work environments are dedicated home offices, large open plan offices, shared office, Business School, mid-size open plan office and film studios. .

Inter-viewee	Gen-der	Age range	Sector	Role & Hierarchical level	Work Environment
R1	F	40-50	Public: Health	Regional Manager: Middle management	Home office and open plan office (large: > 40)
R2	F	40-50	Public: Taxation	Team Leader: Middle management	Open plan office (large: > 40)
R3	M	40-50	Public: Taxation	Programme Director: Middle management	Open-plan office Other sites
R4	M	30-40	Private: Consultancy	Senior Consultant: Senior management	Home office and clients' offices
R5	M	30-40	Private: Finance	Head of Executive Development: Snr mgt	Open-plan office 3 people + Business School
R6	F	30-40	Public/ NGO Leadership	Deputy Chief Executive: Senior management	Open plan office (small: < 10)
R7	M	50-60	Private SME IT	Company Director (Own company): Senior management	Open-plan office (small: <10)
R8	M	20-30	Public: Cultural	Centre Host: Junior staff	Open plan office (mid-size, 15-40)
R9	F	40-50	Private: Consultancy	Sole Trader	Home office and clients' offices
R10	F	20-30	Private: FMCG	Sales Executive: Junior staff	Open-plan office (large: >40)
R11	F	30-40	Private: Film & Media	Film Director (Own company): Snr management	Home office & film and editing studios Middle/big-c creativity

Table 7: Interview profile summary

There are two people in the 20-30 age range, four in the 30-40 age range, four aged 40-50 and one 50-60. The hierarchical levels represented are junior (2), middle management (3), senior management (5) and sole trader (1). The gender balance is six female to five men. Appendix 3 contains profiles of each interviewee. The breadth of the samples sought to ensure that the findings were representative of a wide a range of workplaces and of people working in them. As a qualitative study, this thesis cannot claim universal application of its findings; however, by extending samples over a wide a

range of variables at each stage of the research activities, the study aims for external generalisability, applying its final results to buildings and organisations beyond those studied. The interviews were semi-structured (see Appendix 4) and were all conducted by the researcher. In addition, interviewees were invited to make diagrams of their creative process and of their workplaces; in some interviews the interviewer made drawings of the subject's creative process or workplace for clarification and checked it for accuracy it with the interviewee. Figure 8 (below) shows one such example. The interviews were all recorded and transcribed verbatim.
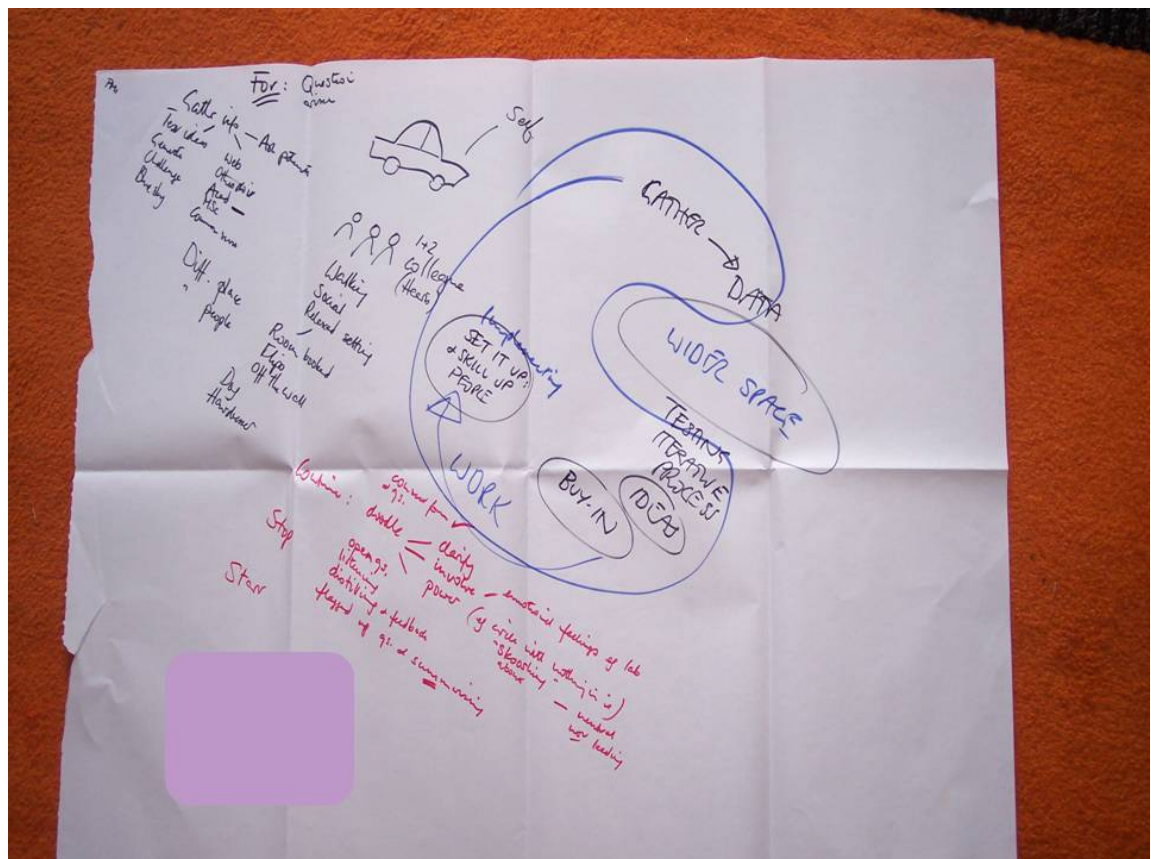
Figure 8: Diagram and notes made by researcher during interview No.1

The interviews were conducted either in the interviewee's place of work or the interviewer's home office. A semi-structured rather than a structured approach aimed to encourage the interviewees to speak freely, drawing them out to reflect on their experience of being creative in their workplace and its implications in their lives (Rudestam & Newton 2007). The researcher found that in all cases the interview was 'a lot less like a question and answer session and more like a discussion between equals where a joint understanding was created' (Furniss et al 2011: 120). The interviewees spoke freely in all the interviews, wherever or however (face to face or telephone) they were conducted, and regardless of whether the interviewee and researcher knew each

other prior to the interview. The key question in the interviews was identical to that of the researcher's professional training sessions: "Where are you, and what are you doing, when you get a good work idea?" This question was followed up by prompts as and when necessary, and boundary-keeping when interviewees strayed unhelpfully from the core subject of the interview, that is: the relationship between their creativity and their physical work environment.

The data from the interviews were coded line by line onto post-it notes, and placed on large sheets of paper (Figure 9 below). The notes were clustered and reclustered iteratively through the constant comparator method until core and subcategories emerged and became, first stable, and then saturated. A data unit was defined as a single statement, word or phrase that related to some degree to an aspect of the interviewee's creative practice. For example, responses to the question "Where are you and what are you doing when you get ideas?" included: "When I am travelling in the car"; "walk the dog"; "yes, go to the hairdressers"; "Somebody gives me an idea and I can build on it"; "it's a matter of evolution"; "it's like watching planes – might be like watching patterns in the clouds" and "so we'll go to St Paul's Cathedral".

Figure 9: Coded and clustered data units

These data units were gathered from all the interview transcriptions before any clustering started; a note from the research journal (RJ) sets out the thinking behind this. RJ 18/1/09: 'If I cluster them as I go, I will skew (or risk skewing) what I pick up [identify as a data unit] from the text. Better to just let the unconscious work away, and then cluster later'. The strips of individual data units were then stuck onto sheets of flipchart paper, clustered, reclustered and rearranged until a point was reached when any further movement simply revisited previous patterns of data. Figure 9 (above) shows one set of clustered data units. RJ 18/1/09 comments: 'Once I got the process right (small strips of post-it capturing data units as I go through the text) the whole thing goes easier'. When key words or phrases of the data units were brought together into clusters, those clusters emerged as clusters of activities.

Influence from the researcher's reading of the literature was evident in the final category titles, the four Ps of creativity (people, product, process and press): because these emerged late in the process after several iterations they can be said to be robust (Charmaz 1994).

4.3.4 Focus Group 1

After the interviews, a cohort of fifteen graduate students was asked the same question as the interviewees: "Where are you, and what are you doing when you have a good idea?" Over the course of an hour they worked individually on post-it notes which were then clustered into categories. The data was analysed after that of the interviews, and added to the interview stage data categories. This activity was undertaken to see whether a different group of people would generate the same or similar data to the interviewees. This was found to be the case, and is examined in detail in Chapter 5.

4.3.5 Case Studies

The two aims of the case studies were a) to refine and seek to validate or disconfirm the concepts that had emerged from Stage 1, and b) to generate more data that might add to Stage 1's existing data categories, potentially creating further categories.

In order to allow rich data to emerge from the case study process, a selective multiple case study approach (rather than descriptive or experimental case study approach) was adopted, because of its ability to focus on specific topic areas. In this way it could give 'a more richly detailed and precise account of the processes at work within particular types of case [that] substantiate or refine causal processes thought to underlie observed

patterns and correspondences' (Hakim 1987:62). This allows the research to 'focus on particular aspects, or issues, to refine knowledge' (Hakim 1987:62); in this case the emergent findings. Because the interview stage findings were emergent, the multiple case study approach added to the diversity of the sample and thus strengthened the emerging theories (Dick 2005). The research examined, refined and sought to validate the three emergent Stage 1 definitions and concepts (a definition of physical press, the concept of the creative footprint and the engage/disengage model of creative behaviour). A case study was an appropriate way forward 'especially when the boundaries between phenomena are not clearly evident' (Yin, 2003:13). The multiple case study approach was also congruent with constructivist grounded theory in that it '[...] relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result benefits from the prior development of theoretical propositions to guide data collection and analysis' (Yin 2003: 13-14). It has, as Yin says, 'a distinct advantage...when a "how" or "why" question is being asked about a contemporary set of events, over which the investigator has little or no control' (Yin, 2003:9).
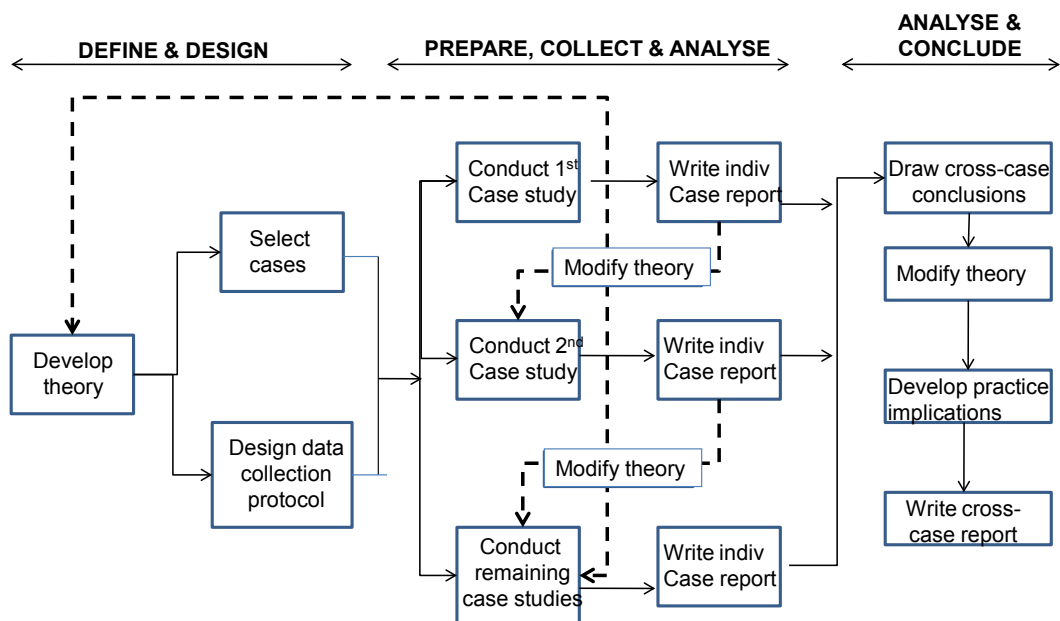
Figure 10: Case Study method including feedback loops (dotted lines)

Yin's case study design (Yin, 2003:50) was adapted so that the process of each successive case study was dependent on the case report of the previous one as the findings, theory and concepts developed through each iteration (see Figure 10). Yin's

method, by contrast, keeps the case reports independent of each other until the cross-case conclusions are drawn in the final *analyse and conclude* section. Yin's heading 'develop policy implications' is amended to 'develop practice implications' as being more appropriate to the context.

The following sections set out the detail of each of Yin's three areas of a case study: define and design; prepare, collect and analyse; analyse and conclude.

The case studies tested the three findings that arose from the Stage 1 research. The key unit of analysis in the case studies was a physically defined and bounded environment in which people work: an entire small organisation in one narrow five-storey building (Case Study 1), a team in an open plan office space (Case Study 2), and a multi-departmental organisation, part of a multinational engineering company, working in a large three-story building (Case Study 3). The data collection protocol was designed to tap multiple sources of evidence in each case study (Hakim, 1987; Tesch, 1990; Yin, 2003) to ensure the accuracy and credibility of findings that arise from a 'corroboratory mode' (Yin, 2003:98). Sources of evidence were: semi-structured interviews with representative members of staff in each organisation, observation of staff behaviour within their working environments, electronic survey of the staff body to ascertain their perspective on their workplace, and organisational documentation to identify how each organisation defines, identifies and rewards creativity. The documentation consisted of architectural and floor layout plans, definitions of and support for staff creativity (Personal Development Plans, appraisals or equivalent), employee suggestion schemes, continuous improvement processes and other visible examples of small-c creativity. In addition to organisational documentation, briefs (including architectural, design and layout drawings) covering the design of the workplace or areas within it were identified. Interviews were conducted with an architect and a designer who had input into the design of the workplace in, respectively, Case Studies 3 and 1.

The three case studies were undertaken consecutively. An iterative process refined each succeeding case study approach in the light of any modifications to emergent concepts or definitions made in the previous case study and any issues specific to the individual study. In Case Studies 1 and 3 the researcher spent one week on site, following the preparatory work of permission-seeking (legal in the case of Case Study 3), process agreement and introduction to senior and other staff. In Case Study 1 staff movement was observed on each floor of the building. Observation was carried out in Case Study

3 in two locations: the Control Room and in a team briefing room, both areas where a group of staff work together (the rest of the staff worked almost exclusively in single-person offices). The observation was based round the three key aspects of physical press (the specificity of place, its properties and its affordances) and the creative behaviours of engagement and disengagement carried out in those spaces (explored in full in Chapters 5). The observation included notes of verbal interaction and diagrams of people movement, working on floor plans of the spaces.

The semi-structured interview format and its key questions remained the same throughout. The emphasis of the survey questions changed slightly between the three case studies: Case Studies 1 and 2 focused on staff experience of their workplace, while Case Study 3 focused on the inter-relationship of the respondent's own creative process and the workplace. The survey's key unit of analysis in all three cases was all the staff involved in the study: the entire organisation in Case Studies 1 and 3, and a single team in Case Study 2. The case study survey questions can be found in Appendices 5 and 6. Organisational documentation was reviewed in Case Studies 1 and 3. This gathered data on assessment of staff creativity and on workplace design to enhance creative work practice. Interviews were conducted with an external designer and an architect. As Case Study 2 was survey-based only no organisational documentation was collected.

The individual case reports that resulted from these case studies focused on a description of the data collected, and on the degree to which these observations required the research theory, concept and definitions to be modified.

The constant comparator analysis of each case study added core and subcategories to those that had emerged from Stage 1. By the end of Case Study 3, the categories emerging from the initial interview and focus group activities were saturated. However, categories which had been subcategories in the interviews and initial focus group now came forward as core categories in the emergent theory of the identification and codification of the elements of physical press that stimulate and sustain creativity in the workplace. Cross-case conclusions were drawn from this shift of focus and further modified theory. It is from these case study activities that the grammar of creative workplaces emerged.

4.3.6 *Case Study Organisations*

The three case studies were chosen purposively to ensure a wide variety of sector, product, organisational type, office layout and unit studied (people and physical space).

Case Study	Sector		Product sector		Organis-ation		Unit studied (people)		Unit studied (physical space)		Office layout	
	Private	Public	Service	Manu-facture	UK	Internat'l	Team	Organis-ation	Single floor	Whole building	Open plan	Single offices
1	✓		✓		✓			✓		✓	✓	
2		✓	✓		✓		✓		✓		✓	
3	✓			✓		✓		✓		✓		✓

Table 8: Overview of case study parameters

Table 8 (above) demonstrates that each aspect of sector, product, organisation, people, place and layout is covered by at least one, and sometimes two of the case studies. Case Study 1 was conducted in a private sector advertising company that is an autonomous subsidiary of a UK holding company. It is housed in a rebuilt 18th century Edinburgh docklands five-storey building, occupying the top four floors. These are set out as open plan, with up to three single-person offices on each floor. Case Study 2 was conducted in the office of an Improvement Support Team (IST), part of the Scottish Government. The team is based in St Andrew's House, Edinburgh and work in one side of an open plan office, shared with a sister team. Over half of the team are home-based and use the office only for meetings and occasional hot-desking. Case Study 3 was conducted in the building of a multinational engineering company that for the purposes of anonymity is referred to throughout the study as MEC (multinational engineering company). MEC is based in a purpose-built three-storey building of single-person offices, designed and built in the 1980s.

The profiles of each company are summarised in Chapter 5 Section 5.3.2, pages 105-108 and in full in Appendices 7, 7.1, 7.2 and 7.3.

4.4 Stage 3: Testing

Findings emerged from Stages 1 and 2 of the research and were modified and verified through the iterative processes of data analysis. Stage 3 aimed to test first the elements, then the method and finally the validity of the emerging grammar of creative workplaces. Each aspect was tested separately: a focus group tested the elements of the grammar, the method was tested in three research environments, and the grammar's

validity was tested in two office environments. The full processes and results of the testing are described in Chapter 6.

The emergent components of the grammar were tested with a focus group of fourteen graduate students. Participants were given a pack of cards on which each separate element of the grammar was printed (place, properties of the place, and affordances in the place). Each pack contained 103 different cards, two of which were left blank, inviting participants to make additions to the elements. The graduate students were asked to work (individually or in pairs) to draw their creative process on large sheets of paper, populating the drawings with the cards. Eight diagrams were produced in total and can be found in Appendix 15.

Figure 11: Creative process drawing with grammar element cards

In Figure 11 (above) the respondent has set out her creative process using the cards to say which places, properties and affordances are important to her. The process in this case is divided in two: the left-hand side of the drawing is concerned with the respondent's everyday creativity at work, while the right-hand side shows what she needs for her art practice. Figure 12 (below) shows the same diagram simplified.

Figure 12: Simplified version of Figure 11

In Figure 12 blue outlines signify indoor places, green outlines signify outdoor places, yellow outlines are the different creative behaviours that facilitate creativity, and the pink/brown outlines are the properties (called characteristics at this stage of the research) of the place that the respondent finds helpful. In this particular diagram none of the affordance cards were used. Doing this exercise provided important insights for the respondent, who had not previously clarified the split between her daily work and her art work. It was noticeable that her art work was stimulated outdoors, while her daily work was supported by indoor environments both at home (bathroom/shower, sleeping space) and at work (art gallery, library).

The eight focus group diagrams were then assessed in terms of which components of the grammar were used and how often, which components were not used, and any additional elements added by the respondents. The results were carried forward into the design of the prototype grammar, developed as an Excel spreadsheet. A full discussion of the components is contained in Chapter 5.

The grammar's method and validity were then tested, using two successive versions of the grammar: the prototype version V1.0, and the final version V2.0. Both tests were also designed to collect and analyse further data. The prototype tests were carried out in

three research environments of a leading US University, and the final tests took place in two UK workplaces. The aim was to test the validity of the grammar in a variety of sectors and location sizes and types.

Very different test locations were chosen (see Table 9 below) so as to test against a variety of situations and sectors. The aim was to find out if the grammar (method and content) was consistent across very different situations. Prototype Test 1 (PT1) of V1.0 of the grammar was carried out in a small windowless room where researchers worked part-time. Prototype Test 2 (PT2) of V1.0 of the grammar was conducted in a large open-plan studio space where users worked full-time, and Prototype Test 3 (PT3) in a specifically design Problem-Based Learning room used in two-hour sessions. The final grammar V2.0 was tested in two UK commercial organisations from different sectors. Final Test 1 (FT1) took place in an open-plan office housing 80 people, with no windows into the office space itself. Final Test 2 (FT2) was conducted in an open-plan office of 200 people which had floor-to-ceiling windows along one side.

Grammar	Location	Assessor background	Interviewees
Prototype test 1	US Research environment (Health Institute single room: 7 users)	UK Reader in Fine Art & Creativity	2 Post-Graduate researchers
Prototype test 2	US Research environment (Architectural studio: 50 users approximately)	US Architecture Graduate student	2 Post-Graduate researchers 1 Final-year undergraduate
Prototype test 3	US Biomedical Engineering undergraduate learning room (8 users)	The researcher	None
Final test 1	UK Engineering organisation open-plan office (80 people)	UK Architect (1)	4 Employees
Final test 2	UK Financial organisation open-plan office (200 people)	UK Architect (2)	4 Employees

Table 9: Grammar test locations, assessors and interviewee backgrounds

To avoid possible bias, and to ascertain whether the prototype grammar's method was clear, the assessment was carried out by someone other than the researcher. Assessors were chosen who had no prior knowledge of the grammar. The PT1 assessor was a Reader in Fine Art at a UK university, and the PT2 assessor was a US graduate student in Architecture. In a third test of the prototype grammar (PT3), the researcher herself evaluated a further environment to double-check the method. In FT1 and FT2 each

assessor was a practicing UK architect, a decision that was made as a result of the findings from the prototype tests. This is explored in full in Chapter 6 which studies the test process and its results.

Version V1.0 tested the grammar's method. Issues of ease of use, clarity of design and layout, choice and briefing of assessors, and scoring mechanisms were addressed. The grammar's method was tested by having an independent assessor use the prototype grammar (V1.0) to evaluate a workplace for its support of user creativity. Version V2.0 tested the grammar's validity. In testing both the prototype and the final versions of the grammar the method moved from constructivist grounded theory to a comparison of two purposively collected data sets. The test looked at the correspondence between: a) what the grammar said about a specific workplace and its ability to stimulate and sustain creativity, and b) how the people using that workplace perceived its ability to stimulate and sustain their work creativity. The data for a) was collected by an independent assessor using the grammar; the data for b) was collected by the researcher through semi-structured interviews with a random sample of users of the space. In each of the tests (three in the prototype stage, two in the final stage) the first data set was collected by a different independent assessor to avoid possible bias. The assessors for PT1, PT2, PT3 and FT1 used a printed version grammar to evaluate the extent to which the physical press might stimulate and sustain workplace creativity. The FT2 assessor used an electronic version on his iPad.

Because of the small sample set in the test phase the examination of the correspondence between the two test data sets (the independent assessment of the workplace using the grammar, and the interviews with users) was informed by qualitative criteria. The correspondence scoring levels and their criteria are set out in Table 10 (below). The scoring goes from 0 – 5. A score of 5 indicates a very close correspondence between what the independent assessor (IA) using the grammar says about an element of the place assessed, and how the interviewees assessed that element. A score of 4 indicates that the IA and interviewees make parallel evaluations of the workplace, but the language is different so that the parallel nature of the evaluation strongly inferred. A score of 3 indicates that the IA and half of the interviewees agree. A score of 2 indicates that the IA and some of the interviewees are in opposition, and a score of 1 indicates an opposing evaluation of the element assessed. A 0 score indicates a complete lack of correspondence between the workplace evaluations of the IA using the grammar, and the users of that workplace.

SCORE	Correspondence levels	Criteria for Correspondence
5	Identical evaluation	Identical/very similar evaluation by the independent assessor (IA) and by all interviewees
4	Parallel evaluation	Parallel evaluation by the independent assessor with that made by all interviewees, but in different language or strongly inferred
3	Partially identical	Identical or very similar evaluation by the independent assessor (IA) and by half of the interviewees
2	Partially opposing	IA makes opposing evaluation from one or more interviewee
1	Completely opposing	IA makes opposing evaluations from all interviewees (or from half of the interviewees, and the others make no mention of the point)
0	No correspondence	No mention made by interviewees of an evaluation point made by IA; or by IA of an evaluation point made by interviewees

Table 10: Correspondence criteria for grammar evaluation

The assessors' evaluation of the space was done point by point through each element of the grammar. The grammar (V2.0) is presented in full in Chapter 6, Section 6.2, Figures 23, 24, 25, and 26, pages 144-150.

4.5 Conclusions

The chosen methodology and methods selected for this research and presented here have impacted on the research in a number of ways. Constructivist grounded theory with its injunction to wonderment (Glaser 1992) provided a framework robust enough to manage the inherent complexities of this study. The iterative nature of its constant comparator method permitted a deep analysis of the rich and complex data discovered in the varied collection process and also provided the basis for adapting the traditional case study approach (Yin 2003). Through the development of core categories, subcategories and data groupings, taken in conjunction with the literature, the theory of the physical press/creativity link was strengthened. The second focus of this study emerged directly from the data categories: identifying and codifying the elements of physical press that stimulate and sustain creativity in the workplace, and hence the grammar of creative workplaces (set out in full in Chapter 7). The grammar test to test

the validity of the hypothesis diverged from constructivist grounded theory in that it was carried out through a data set comparison.

The place of reflexivity in the study, along with the presence of the researcher's prior knowledge and professional experience, has been acknowledged. Constructivist grounded theory with its injunction to use data of 'whatever type' (Glaser 1992: 24, Charmaz, 2000: 514) creates the means of making these potentially biasing aspects transparent, acknowledging where they have influenced the data coding and the identification of emergent categories and theories (Alvesson & Sköldberg, 2000), and making clear how this is balanced in the study.

Constructivist grounded theory has proved equal to the challenge of investigating from multiple perspectives the subjective experience of being creative in the workplace. It has enabled the emergence of initial concepts which have, over the course of the study, become hypotheses capable of rigorous testing. The emergence of these concepts from the data collected and analysed in research Stage 1 (professional practice, focus group and interviews) and Stage 2 (case studies and focus group) is described in the following chapter.

Chapter 5: Stages 1 & 2 Data & Findings

5.1 Introduction

This chapter gives an account of the data and findings emerging from Stages 1 and 2 of the research (the findings from Stage 3 are reported in Chapter 6). It describes how these findings emerged from Stage 1's professional practice, focus group and interviews, and were developed, refined and validated through Stage 2's case studies. In this process the thesis' central hypothesis, the grammar of creative workplaces, emerges and is presented.

Chapter 4 (Methodology) described the research process' three stages: the first stage comprising the researcher's professional practice, eleven research interviews and a focus group; the second stage of three case studies; and the final, or hypothesis-testing stage of a further focus group, three prototype tests and two final tests. These stages and their findings are described in Table 5, Section 4.3, page 71 and are summarised below in Table 11.

	Data Collection	**Data Analysis**	**Research Findings**
Stage 1	Professional practice Eleven research interviews Focus Group	Data categories emerge	Emergent findings ⇩
Stage 2	3 Case Studies	Data categories deepen; some saturated and with information redundancy	Findings modified; central hypothesis emerges ⇩
Stage 3 (Ch. 6)	Focus Group (grammar content) 3 Prototype Test studies (grammar method) 2 Final Test studies (grammar accuracy)	Data categories saturated; information redundancy in most categories	Findings verified; central hypothesis tested ⇩
		Prototype test: method modified ⇨	Final test: method and accuracy confirmed

Table 11: Summary of research Stages 1, 2 and 3 with their respective research activities

Thus the research findings (right-hand column) emerge in Stage 1 and are modified in Stage 2. It is in Stage 2 that the grammar of creative workplaces also emerges. In Stage 3 (Chapter 6) the grammar's method and accuracy is tested, modified and finally verified.

This chapter identifies the three Stage 1 findings (a definition of physical press, the concept of the creative footprint, and the engage/disengage model of creative behaviours). These are each described in turn with their development and modification through the Stage 2 case studies and their contribution to the central hypothesis. The chapter then introduces the thesis' central hypothesis, the grammar of creative workplaces, situating it within the data and the findings. (The full grammar of creative workplaces is described in Chapter 7.)

The constructivist grounded theory method of constant comparison analysis, discussed in the previous chapter, produces considerable amounts of data. These data are clustered and reclustered until core categories emerge and become saturated, and it is from this process that findings come forward in the form of evolving hypotheses and concepts. The next sections introduce each of Stage 1's three core findings and reviewing each in turn.

Stage 1 interviewees are referred to throughout as respondent 1 (R1), respondent 2 (R2) and so forth. The use of respondent (R) rather than interviewee (I) allows the acronym to be differentiated in later chapters from others such as independent assessor (IA).

5.2   Emergent findings (theories and concepts)

As set out in Tables 5 and 11 (pages 71 and 89), and in Figure 13 below, the findings emerging from the Stage 1 data are:

1. A definition of physical press
2. A definition of the creative footprint (including people's awareness of the extent to which physical workspace impacts their creative ability)
3. The engage/disengage model of creative behaviours which describes those behaviours that enable creativity and creative outcomes

From these three findings emerge the elements common to creative workplaces as studied within the terms of this thesis. There is therefore a fourth emergent finding:

4. Emerging common elements of creative workplaces.
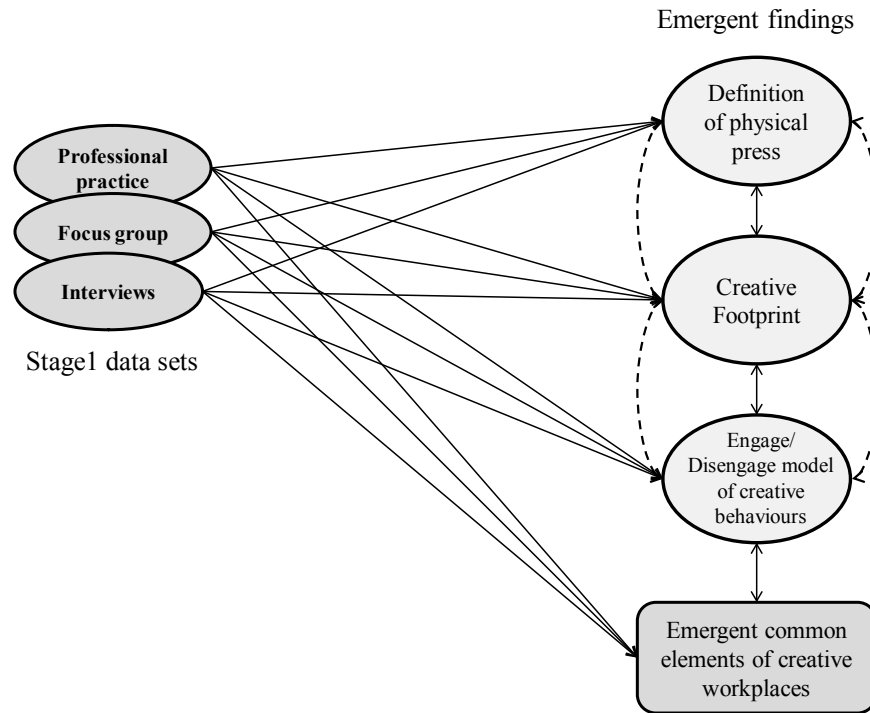
Figure 13: Emergent findings from Stage I data

Each of these emerging theories and concepts are examined in turn.

5.2.1   Finding 1: A definition of physical press

The first finding (see Figure 13 above) is a definition of physical press (Rhodes 1961; Mouchiroud & Lubart 2007). The term physical press refers to the physical environment that surrounds and impacts or presses upon people. The term press is used particularly in the context of creativity research in conjunction with the four Ps of creativity (people, process, product and social press) summarised by Kozbelt et al's (2010) work on the theories of creativity. In terms of this study, physical press can be posited as the physical environment within which creativity-facilitating behaviours can take place. As will be seen, the emergent definition takes account of more than just the physical space or place itself, extending Rhodes' and Mouchiroud & Lubart's term.

The data units (for example Figure 7 page 65, and in full in Appendices 10-14) from the Stage 1 interviewees created three distinct categories within the core category of place: the specific place, what and where it is (for example, inside or outside, a formal or informal workspace, an office or café), the properties of the space that make it significant (for example, light or dark, private or actively busy, spacious or cramped, messy or orderly), and the affordances (the equipment and facilities) within the space

that give rise to the possibility of creative behaviours. Gibson in his work on perception coined the term affordance, defining it as: 'The affordances of the environment are what it offers animals [including humans], what it provides or furnishes, for good or ill' (Gibson 1977: 68). In the data, affordances appear as those elements within the physical environment – equipment, designated areas, writing walls, white boards, facilities and so on – that respondents described as able to 'provide or furnish' the possibility of everyday creative behaviour. This lays the groundwork for the work subsequently done on affordances by Norman from an HCI (human-computer interface) perspective, replacing Gibson's concept of *objective* affordances with that of *perceived* affordances that 'provide strong clues to the operation of things' (1988:9). It is, however, with Gibson's objective affordances that we are working.

These three elements of physical press – place, properties and affordances – are richly present in the data from the interviews, and also to a lesser extent present in the focus group. For example, interviewees talk about where they are when they are generating ideas on their own and with others. The Head of Executive Development in a Financial sector organisation, in talking about the places he found sustained creativity, said:

> We [generate ideas] in rooms like this [small meeting room with central table and flipcharts] and in breakout rooms which are like small version of this. [...] Primarily one-to-one. Maybe phone conversations, tends to be relatively informal, either in their office or in the business school. The nice thing about [this organisation] is there is lots of variety of space, from open rooms, to lounge areas, to the library, so you've got a very unusual choice of space here. (R5)

Interviewees also talk about the properties of the different places they work, and the impact they have. The Deputy Chief Executive of a small NGO talks about her need for light and spaciousness:

> I'm not good in places that don't have light. Light is very important. If there's light and height. [...] I've had to run events, for example, where there's not been light. I can't … I really struggle with that, I really struggle with that a lot. Our office at home is a converted garage and I can't work in it with the door shut. So no matter how cold it is, I've got to have the doors open to get some light (R6)

A junior sales executive in a multinational FMCG company is clear about the affordances she and her colleagues need for a productive meeting:

> Although you can only get about 8 people in there comfortably [...] you can squeeze in about 15. [...] You've got projector screen here, and a little table in the corner that just gets covered in loads of [...] like post-it notes, and pens and blue-tack and then people leave their rubbish on it, and it's just kind of useful,

but not really that useful. And the tables are oval and they sit in the middle, and there's these little chairs round the edge – quite comfy really – and there's usually a flipchart there; and there's a storage facility round here [...] with more pens and ……. it's got all like stationary and stuff. (R10)

The focus group too talk about the different aspects of physical press. Members speak of the different places they find stimulate their creativity: "[walking] around my lake", "in the middle of the forest", "at my desk". They talk of the properties of those places: "in the sun" and "writing in a busy public place"; and of the affordances they find in those places: "access to the internet" and "a notebook".

The concept of physical press emergent from Stage 1 (professional practice, interviews and focus group) is therefore:

> ***Physical press* can be defined as comprising three elements: the specific physical place, its properties and its affordances.**

5.2.2 Finding 2: The creative footprint

The second finding is the concept of the creative footprint. This term is used in this thesis to denote those elements of physical press that uniquely support an individual's workplace creativity. Footprint is used metaphorically, taken from the architectural sense of the total area of ground covered by a built structure. Thus a person's creative footprint is the sum of all the elements of physical press necessary to support their workplace creativity.

In the eleven Stage 1 interviews each individual respondent, working on their own or in work groups, identified a distinct set of behaviours and attendant spaces which uniquely stimulated and sustained their workplace creativity. These behaviours and the implied and explicit spaces varied greatly, to the extent that it was not possible to describe a single space appropriate for everyone's creativity. Although there was a remarkable degree of overall unanimity in the behaviours that people reported as facilitating their workplace creativity (explored in the engage/disengage model of creative behaviours below), the combination of those behaviours and the places in which they happened varied from person to person, from task to task, and from situation to situation. Interviewee 10, the junior sales executive, spoke of several different places that she uses for creativity stimulation: the office, local coffee shops and pubs, informal breakout spaces in the office building, outside in the park:

And because we're quite open-plan [...] all my team, we all sit within, like, hollering distance, a lot of the stuff is shouted across desks and just chatted about.

And:

So we tend to go off-site, so whether it's in a coffee shop, or in a restaurant; or I went to the park, and sat in the park with my boss the other day.

And:

We tend to just, go to the pub; or we go to the breakout spaces, so we've got upstairs where we've got 'the red chairs' which is basically a wall, like a plastic wall which is covered in cows, like big pictures of cows and fields, and then really comfy funky red sofas with tables in the middle of them, which you can: the arms come down, so you can lie down on it; or you can make it into a chaise longue, or you can have it as a couch and it's quite... And then they've got the table football room, which the guys use. Although it's for recreation I think a lot of chat goes on, so … working, I think a lot of ideas come up as well, because, there it's active - you know we were talking about talking and chatting, I think that's where a lot of the time they do in there. (R10)

R10's creative footprint – that is, the physical press she needs to support her creativity – can be said to comprise a variety of spaces within which she is able to a) think on her own, b) communicate with one other person or c) have discussions with a group of colleagues, depending on what she needs at the time.

The creative footprint also emerged as supporting a group. Interviewee 2 (R2), a Team Leader in a large Government Department, described how her teams need different spaces for different tasks:

[The Buzz meetings[12]] take place wherever we want them to take place. Normally not a stand-up session; normally in seated area, either in an area where our team are situated, or any free area – we have various rooms that we can use. We also have what we call a chill-out area that we can use. So it just depends – it's entirely up to the team leader and what space they've got available at any time as to where we hold the meeting. [People] tend to prefer moving away from the actual work stations. It then eases them up – if they're at their desks there is still work going on around them so they can get distracted. Whereas if you take them away into a meeting room or a chill out area where there's nobody else around, they tend to come up with a lot more ideas and examples. It's more like a free speech sort of thing. There's less distractions, so you tend to get more from people in that kind of environment.

And Interviewee 3 (R3), a Programme Director in another part of the same organisation, found that some of his team worked best in informal settings:

_____

[12] Meetings convened with the specific purpose of generating ideas for quality improvements

> You often find people that don't like that very visible [lecture style] structure work much better in a more informal round-table type event. They feel they can contribute, they can dip in and out more comfortably. And you can just get some different voices. (R3)

The data also suggested that the physical press that supports one person's creativity might often be seen differently by another, and what works for one person may not work for another and may indeed have a severely negative effect. For example, Respondent 9, a Management Consultant, finds that being alone in a very busy public place helps her to concentrate on her own thinking, while Respondent 4, another Management Consultant finds such places conducive to serendipitous encounters with information and ideas. Interviewee 6, the Deputy CEO, may choose to be in a busy public place not because it helps her creativity, but because she knows it works for the person she is meeting. So people spoke of using the same places in different ways, depending on their preferences, and the preferences of people they are working with.

As the research progressed it became clear, particularly in the interview data, that people are very aware of their place/creativity relationship. Each interviewee was able to talk about the physical press in which they worked, and how that press impacted the way they and their colleagues were creative in the workplace. Most of the people interviewed were aware of the physical spaces that facilitated their creativity, and also that they actively sought out such spaces. In addition, most of the people interviewed were aware of the kind of space that inhibited their creativity, and talked either of making adjustments to it where possible or avoiding it where they could not adjust it. Finally interviewees exhibited a strong sense of which spaces enhanced or inhibited other people's creativity as well as their own, and spoke of manipulating it accordingly to support or hinder that creativity. For example, Respondent 1, a Public Health Regional Manager, spoke of the effect (both physical and social) of one office environment on her ability to be creative, and contrasted it with her new job where she was able to choose her workplace:

> So it was very much about ... I liken it to, when I trained [as a nurse] … late 70s early 80s … if you went to the psycho-geriatric wards day room, the chairs were all lined up round the walls – it was like that. So the whole set-up was we were all lined up, so we were on these lab stools, facing the wall. [...] We literally were all sitting in a line just like that [drawing the lab] facing the wall. [...] We were in a very tense situation. Because the impact that that actually had on you physically, psychologically, creatively, is amazing. You can actually feel – it's

as if your whole body just slumps … there's a slight slump. Whereas now [in a new job] I'm finding that there is actually – shoulders back, chest out, head high, moving forward. So it just impacts. (R1)

Respondent 7, the Owner/manager of a private small-to-medium-sized enterprise (SME) is aware of his different needs and how they are supported by different work places:

My ideal working environment is a week in [the office] with people, mixing with things, and a week away doing something. But that doesn't seem to happen. I do work at home at the moment, but only one day a week. Ideally it should be 2 or 3 [days], but that's…. and it's just when we're short-handed, holidays. (R7)

Respondent 6, the NGO Deputy Chief Executive, talks about how she assesses the fit between person and place to make her interactions with clients and colleagues most productive:

You know, you start to know [...] you just adapt so that you can have the conversation in a meaningful way, and you can get the most out of the other person's head as well. [...] It sounds manipulative, and maybe it is, but it's something about being able to adapt and change your style and that's how you do things. So I know that I will set up meetings in a particular place if I want to achieve a particular thing. I know I consciously do that, and I'll only go to certain places with certain people. (R6)

The variations of places tended to repeat as patterns for each individual to the extent that they could be seen as a *creative footprint* unique to each person.

Data from focus group respondents (Appendix 8) also supported the concept of the creative footprint. Each was able to articulate the combination of environments they needed. Thus the focus member who said: "I walk to or from coffee shops and toasted sandwiches! They are my 'thought' rewards" needs the outdoor spaces of the street and the coffee shop. Another member talks about "Writing in a busy public place". In some cases the place is indirectly inferred rather than specified, as in: "Working on an idea often already in progress. When working on something else a chain reaction occurs – so sometimes in the studio".

Data from the professional practice also inferred that people were aware of which physical environments supported their creative thinking. For example, respondents spoke of needing inside and outdoor spaces in which to walk, and "talking spaces" where two or more people could "knock ideas about".

The creative footprint is the sum of the elements of physical press needed by an individual or group to support the activities that lead to creativity. It is therefore possible to propose that:

The *creative footprint* is a set of physical press elements which together uniquely form an individual's or a group's optimum physical environment for stimulating and sustaining workplace creativity, in changing situations.

5.2.3 Finding 3: The engage/disengage model of creative behaviours

The third finding from Stage 1's professional practice, interview and focus group data is a model of behaviours that facilitate creativity. The findings suggest that people engage in a describable set of behaviours that stimulate, and support over time, their small-c creativity in the workplace. An early indication of this in found in the professional practice data where three categories of creative incubation (Wallas 1926; Evans & Russell 1989) are suggested. These are active, passive and experimenting incubation and are based on Evans & Russell's (1989) creative process.
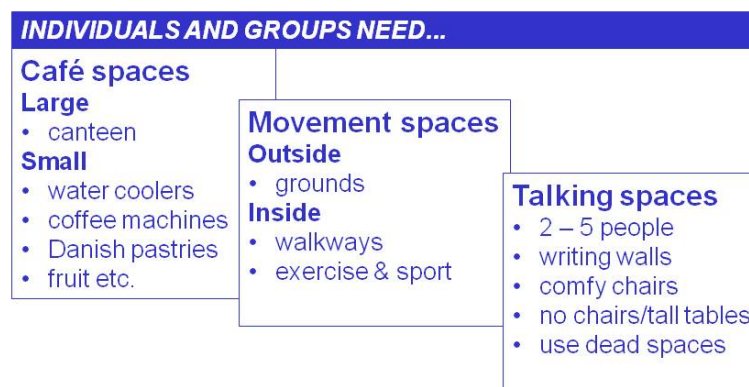
Figure 14: Slide from client presentation of spaces for active incubation

These are described in a presentation made to the client, discussed in Chapter 1, who had commissioned the researcher to design a space within his fabrication plant to "help

[his] engineers to think better". Figure 14 (above) shows the slide that sets out the spaces identified as supporting staff in the different behaviours that support what the researcher's company (2nd Order Thinking) called active incubation. The complete presentation can be found in Appendix 2.

Thus individuals and groups, it was suggested, needed a variety of places within which they could stimulate and sustain creative thinking. These included cafe spaces where they could meet by chance or deliberately, spaces where they could walk indoors and outdoors, and places where two or more people could hold spontaneous and planned conversations, complete with the pertinent affordances (for example writing walls, comfortable seating or no seating at all) set out in Figure 15 below.

INDIVIDUAL   GROUP

Coffee/tea	Take a break	**Distraction**	Do something else
Cigarette/chocolate	Do something else		Tackle another task
Tackle another task			
	Car/driving	**Movement mechanical**	Travelling together
	Bus/train/plane		
	Cycle		
	Jog/run/walk/swim/climb	**Movement physical**	Walking together
	Think on your feet		Thinking on your feet
	Make it/try it out		Make it/try it out
Dropping off/waking up/dozing --------- Sleep		**Disconnection**	Change environment
Mind wandering – Daydream/Potting shed			Nurture
Bath/shower/sitting by water --------- Water			
Wind/hills/beach -------Horizon			
	Idea-generating techniques	**Connection deliberate**	Idea-generating techniques
	Network		Search, Recycle
Browse: net/library/events/lectures/conferences			Knock ideas about/talk it over
Visual techniques: mind map/doodle/graphs			Try it out/iterative thinking
			Café conversations/Bohmian Dialogue
			Visual techniques: mind map/doodle/graph
	Synchronicity	**Connection chance**	Synchronicity Mind maps
	Think out loud		Talking walls Fishbone/Gantt/graphs
Visual techniques: mind maps/doodle/graphs			Visual display Meta-planning/thinking

Figure 15: Creativity-stimulating behaviour categories emerging from professional practice

Thus, behaviours brought forward by people in the professional practice training groups include all those listed in Figure 15 above. For example, behaviours for disconnecting from one's surroundings include (for an individual) dozing off or daydreaming, being

by or in water, and having a sense of horizon. For groups they include a change of environment, and nurturing ideas from others. Six main behaviours were identified from the professional practice in individuals and in groups. These included taking a short break that distracted people from the task in hand; physical and mechanical movement such as walking or a train journey; deliberately disconnecting from the problem or issue by 'sleeping on it' or daydreaming; and connecting with sources of ideas, either deliberately seeking them out, or inviting synchronicity. In order to verify these findings emerging from the professional practice, the focus group data (Appendix 8) were cross-analysed between the categories of creativity-stimulating behaviours (Figure 15 above) and Evans & Russell's (1989) individual creative process (Table 3, page 17). Each of the categories in Figure 15 (above) was present in the focus group data, and much of the data repeated in the two data sets. The full analysis is presented in Table 13 page 101.

The interview data were then analysed and the four Ps of creativity (people, product, individual and group creative processes, and social and physical press) emerged as the main categories. The professional practice categories of creative behaviours (Figure 15 above) were repositioned as subcategories of individual and group creative processes. As the data were further analysed, two meta-levels of creative behaviours emerged: engagement and disengagement, set out in Table 12 (below).

Engagement		Disengagement			
Deliberate engagement with people, information & ideas	Chance engagement with people, information & ideas	Disengagement from others & context through physical movement	Disengagement from others & context through mechanical movement	Disengagement from the issue or context through short distractions	Disengagement from others, the issue or context through longer periods of time

Table 12: Summary of data categories of behaviours that stimulate, sustain and support workplace creativity

In the engagement category people talked about wanting to engage with other people and with ideas and information. They wanted to engage with others to "in-the-moment create some options, discussions, ideas" (R5) and to "actually listen to what people have to say" (R1). They spoke of needing to engage with information and ideas, to "check stuff, look at books, look at the web" (R4). Their engagement was most often planned, but could also be by chance: "I will sometimes [...] randomly just press a capital letter [on my mobile phone] and say: What would X say on this? In my head, as it were. But then I might say: Let's phone her [...]; with really intriguing results" (R5). Table 12

summarises the creativity-facilitating behaviours that emerged from the data. In the disengagement category people reported needing to disengage from other people and their immediate context so that they could better concentrate on their own thinking. They also spoke of needing to disengage from the issue or problem that they were working on, either to allow it to incubate (Wallas 1926; Evans & Russell 1989) or to simply distract themselves from it briefly. The disengage category subdivided into behaviours involving movement and those involving time. The category of disengagement through movement further divided into physical movement: "[Walking] where I know I'm not going to bump into a lot of people [...] Not having the confines of any physical space, so you can psychologically in your head follow trails of though all the way through" (R1), and mechanical movement: "Normally [I think] on the train on the way home" (R3). Those activities where time is a significant factor subdivided into two. Firstly, a few minutes of disengagement from the issue to refresh their thinking, for example: "If [...] my head gets too busy I go off and come away and think: Oh gosh, I forgot about this" (R1) and "Watching patterns in the clouds" (R9). Secondly people reported disengaging for hours or days from others and from the environment, for example: "[Ideas come] when I'm being quiet, and still. Stillness is an important thing, and pausing. And that's important for things to step out. But I also think that stillness is important to see connections – the outside in some sense mirroring what's inside. When you notice things about the way the world is" (R4).

Thus respondents talked about wanting to deliberately engage with people, information and ideas in different ways, inside and outside work. They also reported wanting to have the opportunity to engage by chance with others, with information and ideas – of having serendipitous encounters. They spoke of needing to disengage from other people and their context through physical movement, especially walking; and of disengaging through mechanical movement such as train and car journeys. Finally respondents reported disengaging from the problem or issue through short distractions – a coffee break, looking out of the window – and through longer periods of time when they would "digest" (R9) the problem.

Core category	Professional Practice	Focus Group	Interviews	
Engagement (Deliberate)	Knock ideas about/talk it over Idea-generating techniques Networking Browse the net/library/go to events/ lectures/conferences Use visual techniques (mind maps, doodling, Gantt charts, graphs Try it out/iterative thinking	Conversation Field research Cafe diagramming MMOPGS [meeting virtually] Coding Piano Writing	Mix people & levels Cross-area synergy & links Apply practice across organisational areas Collaborate Co-creation Creative processes Communications Teams virtual & real Meeting/discussion types Trigger conversations Getting started Pain (effortful production)	Questioning/asking/ listening Visualisation of ideas – visual techniques Testing Influence & buy-in Implementation How – methods for breakthrough Challenge Changing ideas Best practice I've got a bit of a brand known for having walking meetings. I'm constantly walking with people Meetings by walking
Engagement (Chance)	Synchronicity Networking Browse the net/library/go to events/lectures/ conferences Synchronicity Visual display and talking walls (mind maps/ fishbone diagrams/ Gantt charts/ meta-planning)	Reframing Surfing Reading	Active incubation (doing) Gathering Scanning for possibilities Serendipity Trigger/stimulus	Challenge: to and from self Unexpected, excitement & risk Paradox Random phoning
Disengagement (Physical movement)	Jog, walk, swim, climb, cycle Think on your feet Make it/try it out Walking together	Walking, cycling, swimming Flow situations Yoga, aerobics Gardening, feeding pigs	Being able to go for walks I can go up a hill, I can go down to the river with the dog, Every morning at 6am I go out on my bike I went to the gym in the mornings	Walking just to give your mind a rest Going for a long walk I just choose to keep walking Thinking about nothing Gardening
Disengagement (mechanical movement)	Car, driving Bus, train, plane Travelling together	Driving Plane/train/bus/tube Travelling/ in transportation	On the train on the way home Trains are great places for things to pop out of my unconsciousness Working on the train on a laptop On a motorbike then that lends perspective	
Disengagement (short distractions)	Take a break Coffee, tea, cigarette, chocolate Do something else Tackle another task	Coffee break Bath and water Daydreaming Music Abstraction Relaxation Virtual world games	Having a cigarette, or a coffee, it's grabbing something to eat, or whatever Music Watching patterns in the clouds I just look at nothing, and think consciously, nothing. Drink a cup of coffee, a glass of water, close my eyes, just stop.	
Disengagement (longer time)	Sleep: dropping off to sleep, waking up, dozing Day-dreaming: mind wandering, 'potting shed moments' Water: bath, shower, sitting by water Horizon: wind, hills, beach Change of environment Nurture self and others	Bed/sleep/ dreaming (In the forest/by the lake/in the garden)	Incubation (waiting) Idea developing & building Reflection/solo time Idea developing & building Visualising Synthesis I actually need the digestion time [...] I like to absorb and integrate it back in.	

Table 13: Comparison of data units and categories across Stage 1 data sets: professional practice respondents, focus group and interviews

The same behaviours emerged, with small variations, across each of the Stage 1 data sets (professional practice, focus group and interviews). The data that relate to engagement and disengagement behaviours map across the three data sets (Table 13 above). For example, in the subcategory of deliberate engagement the professional practice's "use visual techniques" appears in the focus group as "cafe diagramming"[13] and in the interviews as "visualisation of ideas – visual techniques". In the category of chance engagement the professional practice's "browse the net" is "surfing" in the focus group and "scanning for possibilities" in the interviews. These parallels are repeated in each of the six subcategories of creative behaviour, with some variations. For example, in mechanical movement one interview respondent reported that being "on a motorbike [...] lends perspective", but motorbike travel does not appear in either the professional practice or the focus group. In the same way one focus group member's physical movement includes "feeding the pigs" while interviewees talk of walking their dogs, and professional practice reports jogging – similarly energetic physical behaviours, but particular to the individual reporting them. Thus within the six subcategories of the main engagement/ disengagement meta-level there are specific differences dependent on the reporting individual. In other subcategories the parallels are very close: coffee breaks are mentioned in all three data sets as a way of disengaging for a short time, and train journeys appear in each data set as a way of disengaging through mechanical movement.

A model of creative behaviours is therefore suggested that frames the different behaviours that people report as directly and indirectly aiding their creativity. In its emergent form it can be said that:

> **The engage/disengage model of creative behaviours describes the two principal categories of behaviours (with their subcategories) that enable workplace creativity.**

5.2.4 *Emerging common elements of the creative workplace*

The data from the professional practice, focus group and research interview stages prompted the observation that the same physical elements of the environment were repeatedly mentioned in relation to small-c creativity in the workplace. It was observed that these elements demonstrated close links to the emerging concepts of the engage/

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[13] A reference to World Cafe Conversations www.theworldcafe.com

disengage model of creative behaviours and to the definition of physical press. The elements were, firstly, those parts of the physical environment necessary for people to carry out the creative behaviours described in the engage/disengage model, and secondly the elements that correspond with the three categories defining physical press – the place itself, its properties and its affordances. These research findings suggested two possibilities: that potentially the key common physical elements in the workplace that stimulate and support small-c creativity could be identified; and that these elements might possibly be structured in the workplace by reference to the engage/disengage model of creative behaviours and the definition of physical press. This emerging theory was also informed by the literature of Pattern Language (Alexander et al 1977; Alexander 1979) and Space Syntax (Hillier & Hanson 1984).

In summary, the findings emerging from the analysis of Stage 1 research (professional practice, interviews and focus group) are:

a) It is possible to define physical press as comprising three constituent elements of place, properties and affordances;

b) Everyone in Stage 1 has their own unique creative footprint which varies dependent on task and situation (and is aware of the positive and negative impact that the physical environment has on their workplace creativity and act accordingly to change, avoid or manipulate it);

c) Creativity in the workplace arises from a series of behaviours that can be described in a model of engagement/ disengagement; and that

d) It is possible to identify and structure those discrete elements of the physical environment that stimulate and support creativity in the workplace.

These emergent findings were then examined through a series of three case studies.

5.3 Stage 2: Case studies

5.3.1 Introduction

This section describes the process through which the emergent findings were assessed and the extent to which they were refined, deepened and verified (see Table 14 below). Each of the findings set out in Section 5.2 is looked at in turn through the lens of succeeding case studies. Modifications to, or questions of, each finding are discussed. A final version of each finding is then offered.

STAGE 1		STAGE 2		STAGE 3	
Aim:		*Aims:*		*Aims:*	
• *Data collection and analysis*		• *Verification & refinement of Stage 1 findings* • *Collection & analysis of additional data*		• *Testing the emergent grammar's content, method & accuracy* • *Collection & analysis of additional data*	
Method	**Findings**	**Method**	**Findings**	**Method**	**Findings**
Professional practice	Physical press definition	Three case studies:	Stage 1 findings verified, and some refinements and additions made	Focus group for testing content	Additional elements added
Interviews	Creative footprint	Advertising agency Government dept. Engineering co.		Three studies for testing method	Layout design changed
Focus group			Emergent grammar of creative workplaces		Test scale changed from Likert to semantic differentiation
	Engage/disengage model of creative behaviours				Test method altered
				Two prototype case studies for testing accuracy:	Grammar accurate
				Engineering co. Financial Services	

Table 14: Stage 2 of the three-stage research process

As described in Table 14, the aims of Stage 2 were to verify and refine the findings emerging from Stage 1, and to collect and analyse additional data. These aims were fulfilled, and at the conclusion of this stage all the findings had been verified, and some refinements and additions made. In addition the grammar of creative workplaces emerged from the refined findings.

Three organisations took part in this research project as case studies: an advertising company (Case Study 1), a government department (Case Study 2), and a multinational engineering company (Case Study 3). To set the context within which the emergent findings are reviewed a summary of each organisation follows which sets out the organisation details including physical and social environment, the number of people involved in each case study and how they are involved. The emergent findings are then analysed through the three successive case studies.

5.3.2 Case Study Organisations

As set out in Chapter 4 (Methodology) the case studies were selected for a wide range of physical and organisational environments. Each case study company or organisation is housed in very different physical environments. Case Study 1 (CS1) is a private sector advertising company in a narrow 5-storey dockside modern version of a seventeenth century house in which one hundred and nine people[14] work in mainly open plan floors; Case Study 2 (CS2) is a public sector single floor open-plan office in which 65 people work, part of an Art Deco-influenced 1930s government building; and Case Study 3 (CS3) is a private sector multinational engineering company in a purpose-built blast-resistant building dating from 1980, housing two hundred and ten people[15] mainly in single-person offices. In CS1 and CS3 all the staff in the building were studied, and in CS2 one team was studied. CS1 and CS2 are service organisations, whereas CS3 is a manufacturing company. Thus contrasting sectors, products, buildings, office layout, staff sizes and study units were chosen to examine the findings across different situations.

Details of each case study company and the research conducted within it are held in Appendices 7, 7.1, 7.2 and 7.3.

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[14] This number is approximate, as the company is rarely at full strength, and was in the process of hiring new staff over the course of the case study
[15] Of which up to 60 at any given time are independent contractors, and up to 20 visiting from other company sites across the world

Case Study 1 was conducted in an Edinburgh advertising company in an autonomous subsidiary of a UK holding company. Its docklands office (see Figure 16 below) has four floors (1st, 2nd, 3rd and 4th) with ground floor level entry over a restaurant and a corridor to a private car park at the rear. The front of the building with its views over the docks is full of natural light on each floor; the side and back of the building look out over the car park, and the windows overlooking it have restricted light and views on the 1st and 2nd floors.

Figure 16: View along the waterfront of Leith Docks, Edinburgh, towards the CS1 building

Within the methodology of constructivist grounded theory (Glaser & Strauss 1967; Charmaz 2000; Creswell 2002) and the case study structures proposed by Yin (1994), four separate data collection methods were used in conducting this case study: observation (notes and diagrams), interviews, examination of company documentation and a whole company electronic survey. This allowed the data to be triangulated for optimum accuracy.

Case Study 2 was undertaken with an Improvement Support Team (IST) of the Scottish Government that "supports the delivery of policy and key performance priorities and targets[16]". There are five internal sub-teams whose targets are to deliver different aspects of policy and performance and to share good practice towards improving the quality of their services.

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[16] Website http://www.improvingnhsscotland.scot.nhs.uk/programmes/ as at 12th October 2010

Figure 17: External view of St Andrew's House, Edinburgh

The team comprises sixty-five[17] people, of whom twenty-nine work permanently and exclusively in one half of an open-plan office in St Andrew's House (SAH) (see Figure 17 above), a Scottish Government building in Edinburgh. The team are in the left wing of the building. A further thirty-six work remotely from their homes, hot-desking in SAH. Everyone on the team, therefore, works at some point in the SAH office either as a 'permanent' or a 'hot-desk'. The office is on the 2nd floor of the building with windows along both sides affording good natural light and spectacular views on the southern, IST side of the office. The other longitudinal half of the office is occupied by another team that works in collaboration with IST. Because of management restrictions, the data were collected by electronic survey only (the same as CS1's, with changes in organisational details only) and no interviews were conducted with IST staff. In preliminary discussions, the IST management stated that all the creativity used within the team was small-c creativity.

Case Study 3 was conducted in a multinational engineering company operating from a single purpose-built administration building adjoining their manufacturing plant. The researcher had free access to all parts of the building, including the Control Room and the plant (when accompanied). The majority of staff worked in single-occupancy offices; only the engineers in the Control Room and those working on the plant had multiple-occupancy offices. When the building was built in the 1980s the office walls were designed so as to be demountable to form larger workspaces. Although this had happened in the past, most of the walls had been reinstated by the time of the case

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[17] At the time of the case study there were 3 vacancies in SAH, and 4 vacancies in remote working

study. The company understanding of creativity is framed by its primary concerns of performance and safety[18]. Performance Assessment Worksheets for individual work assessments refer to creativity twice: 'creation of useful work' in the section on 'Quality of Work', and 'Creativity & Innovation: Involves generating creative or innovative ideas, solution, or techniques having useful application'. The documentation, the interviews and the observation all supported the conclusion that creativity in CS3 is predominantly small-c creativity that is socially meaningful (Richards 2010) and enhances 'everyday life and work with superior problem-solving skills' (Simonton 2005).

The case studies were conducted to test the findings emerging from Stage 1 (the professional practice, the focus group and interviews) within a wider organisational context. At the same time the data from the case studies added to and deepened the Stage 1 categories.

5.3.3 Physical press: case study refinement and verification

The definition of physical press emergent from Stage 1 (professional practice, interviews and focus group) is:

> ***Physical press* can be defined as comprising three elements: the specific physical place, its properties and its affordances.**

The case studies were designed (Yin 2003) so subjects could speak of the elements in their workplace that both helped and hindered their work creativity. The form of the case studies was intended to elicit data on physical press, and the electronic surveys in particular focused on its different elements. Data on all three elements were triangulated within the case studies from interviews, survey results and observation. Three tables (Table 15, page 110; Table 16, page 111; and Table 21, page 120) set out each element of physical press in turn (place, properties and affordances), showing how the data from each case study extended and deepened the subcategories.

In analysing the three case studies, no new categories were added to the three elements of physical press (place, properties and affordances). These three elements, however, became more richly populated as further data groupings emerged and the case studies added detail and depth to the interview findings.

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[18] The researcher underwent a rigorous induction process and it was made clear that any infringement of the safety rules would result in the study being closed.

Looking first at place: the case studies added considerable data on the types of places reported to enhance creativity in the workplace. For example, where the interview data spoke in general terms about offices having "good spaces; big open spaces" in the case studies it became possible to subdivide these categories into neutral shared areas, proximity to windows and internal walking spaces. Places reported included formal and informal offices, and spaces inside and outside workplace buildings. The data contained in Table 15 sets out and compares the detail of the creativity-enhancing places reported in the case studies. In Table 15, offices are seen to be sub-divided into open-plan, shared and single occupancy offices. There were no open-plan offices in CS3, only single or shared occupancy with less than six people, most often two, sharing the room. In CS1 meeting rooms were either formal, informal and ad-hoc. In both research stages desk space, position and availability are described. Informal spaces include 'neutral shared areas', breakout, 'touch-down' and relaxation areas. However, in Case Study 3 the relaxation area which is a 'pod' in a room off the Control Room was not used. If anyone fell asleep in it their colleagues were likely to paint their face or cover them with shaving foam. Engineers in CS3 who do not have their own office use remote rooms such as the rack room (where materials are stored) to get some quiet thinking time, and people in Case Study 1 use the 'smokers' corner' for informal chat. Where the interview data talked about 'catered spaces' the case study data deepen the subcategory to include kitchen areas, canteens, an internal coffee shop and vending machines inside the office. Outside the office the catered spaces remained the same, with both data sets including coffee shops, restaurants, pubs and hotels. Internal spaces such as corridors and stairs were referred to as places for walking to clear the mind, and for chance meetings.

For workplaces outside the office, as with catered spaces, nothing new was added to the interview subcategories of home office or space in the home, other offices owned by the same company, transportation (plane and train) and external space for walking. Only one subcategory from the interview data was not reflected in the case studies – that of 'busy public spaces'. Both the interviewees who reported using such spaces are self-employed consultants who travel extensively making use of whatever spaces are available, which may explain why they often use train stations and airport departure lounges. "Unallocated desk space" and "aeroplane" are present in only one of the case studies; otherwise, every subcategory is reported in two out of the three case studies.

Place (detail)	Case Study 1 (data source)			Case Study 2	Case Study 3 (data source)		
	Interviews	**Survey**	**Observation**	**Survey**	**Interviews**	**Survey**	**Observation**
Office (open plan)	X	X	X	X			
Office (single)			X		X	X	X
Office (shared)						X	X
Single desk	X	X	X				X
Near window	X	X	X		X		X
Informal meeting spaces (some ad hoc)			X				X
Meeting room (formal)	X	X	X		X	X	X
Unallocated desk space					X		X
Neutral shared area	X	X					
Breakout areas				X			X
Touchdown space				X			
Corridors/stairs/landings	X	X	X				X
Internal walking space	X		X	X		X	X
Remote rooms (eg rack room)						X	
Relaxation area	X			X			X
Kitchen area			X	X			
Coffee shop (internal)				X			
Vending machine					X		X
Canteen				X			X
Change of scene	X	X	X	X			
Outside on plant					X	X	X
Smoking area	X		X		X		
External walking space					X		X
Other (sister) office building	X	X		X			
Home	X	X		X			
Coffee shop (external)	X	X	X				
Train	X	X					
Aeroplane		X					
Outside the work building	X	X			X		
Hotels	X	X	X		X		
Busy public spaces							

Table 15: Place elements of physical press compared across case studies

Properties (detail)	Case Study 1 (data source)			Case Study 2 (data srce)	Case Study 3 (data source)		
	Interviews	**Survey**	**Observation**	**Survey**	**Interviews**	**Survey**	**Observation**
Natural Light	X	X	X	X	X	X	X
Brightness/ glare	X	X	X	X			
Views	X	X	X	X		X	X
Sense of horizon			X	X			
Spaciousness	X	X		X		X	X
Cramped	X	X	X				
Fresh air in office					X		
Air quality		X			X		X
Temperature	X	X		X	X	X	X
Comfort (chair)	X			X			X
Colour :tranquil/bright				X			
Decor	X	X					
Messiness/ clutter	X	X	X	X	X		
Order		X			X		X
Cleanliness				X			
Noise/distraction levels (too high)	X	X	X	X	X		
Noise levels (quiet)		X		X		X	X
Noise levels (machines)				X	X	X	X
Buzz/busy-ness	X	X	X			X	X
Movement	X	X	X	X	X		
Calm				X		X	X
Privacy		X		X	X	X	X
Secluded		X			X		X
Fresh air (outside)	X				X		
Personalise space				X	X		X
Counter-indications				[Glasgow office] good to work in and has none of these properties			

Table 16: Properties elements of physical press compared across case studies

The next element of physical press examined is its **properties**. These emergent properties that support people's creativity were substantially enriched by the case studies. The properties reported to enhance creativity are set out in Table 16 (above). Table 16 shows that some properties occur across all the case study data sources of interviews, surveys and observation. Categories that had emerged in Stage 1 all deepened and reached information redundancy. These were: natural light, fresh air, spaciousness and long line-of-sight, quiet and appropriate noise levels, privacy, lack of interruptions or distractions and a need for one's own territory or personalised space. Newly emergent properties were issues of brightness and glare, particularly in relation to computer screens, a need for views and a sense of the horizon, temperature and air quality, comfort (particularly of chairs), colour and decor, and the sense of orderliness and mess.

Reports of natural light and its importance were present in each of the case studies, and from each data collection method of interview, survey and observation: "I think the light makes a big difference. I spent a couple of years in [...] an enclosed space with no windows [...] and that was quite depressing" (CS3). The categories reported most frequently after light were: views: "You can use the view to help you think and shut out background noise" (CS2), temperature, messiness/clutter, noise levels/busy-ness, and movement. These occurred in five of the seven data collection areas across the three case studies. Brightness/glare emerged in relation to computer use and artificial light: "The existing lighting in SAH is too harsh" (CS2) and "[We] switch the lights out by turning the florescent tubes so they don't make contact. Ceiling light above each station – take them out. [...] It is just for the screen, feel cosy – you and the screen. No distraction like bright lights" (CS1). Spaciousness, noise levels from other people and from machinery (photocopiers a particular nuisance), and the need for privacy occurred in four of the seven data collection areas. The other properties all occurred in between one and three of the data collection areas: horizon, feeling of being cramped, need for fresh air in the office, air quality, comfortable chairs, colour and decor, orderliness, a feeling of calm, access to fresh air outside the building, and the sense of being able to personalise your workspace. One counter-indication arose in CS2 where the government's Glasgow office was cited as a good place to work despite having "none of these properties" of views and good natural light. It is possible to argue that this is an indication of the weighting (as in the interaction model of creative behaviour, Chapter 3) of the social press in St Andrew's House (SAH) towards conformity, outweighing the

kplace's properties of physical press that could otherwise support creative thinking. Thirteen of the twenty-two respondents to the survey in SAH said that they did not feel it was all right to experiment and take risks, marking their response 0 or 1 on a Likert (1932) scale where 5 is high. A further five respondents marked their response at 3, and only three people out of the twenty-two indicated that they felt that the SAH environment enabled them to experiment and take risks scoring 4 or 5.

A striking finding that emerges is that the identified properties are sensory.

Property	Sense	Original classification
Natural light	Sight	Aristotle
Brightness/ glare	Sight	Aristotle
Views	Sight	Aristotle
Sense of horizon	Spaciousness	Neurology
Spaciousness	Spaciousness	Neurology
Cramped	Spaciousness	Neurology
Fresh air in office	Smell/taste	Aristotle
Air quality	Smell/taste + temperature	Aristotle + Neurology
Temperature	Temperature	Neurology
Comfort (chair)	Touch	Aristotle
Colour: tranquil/bright	Sight	Aristotle
Decor	Sight	Aristotle
Messiness/ clutter	Spaciousness	Neurology
Order	Spaciousness	Neurology
Cleanliness	Spaciousness	Neurology
Noise/distraction levels (too high)	Sound	Aristotle
Noise levels (quiet)	Sound	Aristotle
	Sense of speech	Steiner
Noise levels (machines)	Sound	Aristotle
Buzz/busy-ness	Sense of aliveness	Steiner
	Sense of speech	Steiner
Movement	Proprioception	Neurology
Calm	Sense of thinking	Steiner
Privacy	Sense of thinking	Steiner
Secluded	Sense of thinking	Steiner
Fresh air (outside)	Smell/taste	Steiner
Personalise space	Sense of life (feeling alive)	Steiner
	Sense of the I (ego)	Steiner

Table 17: Properties, their corresponding senses and original classification

Table 17 indicates how each property in Table 16 corresponds with a particular sense, and its theoretical origins. While the sensory categories emerging from the interviews were the five Aristotelian senses of taste, touch, smell, sight and hearing, the case study data referred to a greater range of senses. These are, firstly, neurological senses, and secondly, senses identified by Rudolf Steiner (1916). There are many more neurological senses identified in the literature that were not reported by the respondents,

for example the sense of pain. The senses listed here are exclusively those that emerged from the data.

As the case study data were analysed the data categories and subcategories were re-evaluated and some were grouped together in broader categories, set out in Table 18 below.

Senses	Sensory properties
Taste Smell Touch Temperature (warmth/cold)	**Comfort**
Sight	**Sight**
Sound	**Sound**
Spaciousness	**Spaciousness**
Proprioception/movement (kinaesthetic sense)	**Movement**
Speech Thinking Life (feeling alive) The I (ego)	**Aliveness**

Table 18: Final sensory categories for physical press - properties

Table 18 shows how sight remained a single category, as did sound, spaciousness (expanding to include messiness/orderliness) and proprioception (movement). Taste and touch, along with temperature (including air quality) and chair comfort were categorised together as *comfort*; and the Steinerian senses of speech, thinking, life and 'the I' grouped together as *aliveness*. These six categories of sensory properties emerged from across the research. Each of the six categories saturated as the data were progressively analysed through the constant comparator method of constructivist grounded theory (Charmaz 2000). The literature supporting these sensory categories and their place within the definition of physical press is reviewed.

5.3.3.1 Literature on the senses in the workplace

Before examining the data supporting the final part of physical press: affordances, the literature on the senses and workplace creativity is reviewed below in Table 19.   There is extensive literature on the anthropology of the senses (Classen 1997), and each sense commands a field in and of itself. Each of the senses brought forward by research respondents in the context of their creative performance therefore has an associated literature.

Sense category	Description	Studies relating sensory categories to creativity
Comfort • Taste/smell • Touch • Temperature & air quality	Primary importance in supporting motivation	Brill, Margulis, & Konar 1984
	Effect of different types of smell on creativity not significant	Krasno, 1992; Carroll, 2006
	Effect of smell on emotion (re consumer buying patterns)	Chebat & Michon 2003
	Different chairs for different people and situations	Alexander et al 1977
	Use of natural materials and less use of manufactured materials enhances perceived creativity	McCoy & Evans 2005
	High impact of furniture on creativity	Brill et al 1984
	Temperature, draughts, humidity and work environment air: staff productivity and morale up, reduced sick-leave	Milton, Glencross & Walters, 2000; Wargocki, Wyon, Sundell, Clausen & Fanger 2000
Sound	High levels of environmental distraction associated with a perception of decreased organisational support for creativity	Stokols, Clitheroe & Zmuidzinas 1996
	High noise levels adversely affecting overall comfort and employee motivation	Brill et al 1984
	Noise impact on creativity varies depending on the individual	Toplyn & Maguire 2009
	Negative effect of noise on children's long-term recall	Hygge 2003
	Background music as distracting as background noise for introverts	Furnham & Strbac 2002
Sight • Views (external) • Views (internal) • Light (natural) • Light (artificial) • Colour	Primacy of sight over the other senses	Steiner 1916; Gibson 1977; Bruce, Green & Georgeson 2000; Pallasmaa, 2005
	Primacy of sight challenged within the built environment	
	Biophilia/affinity with nature and to living systems	Kaplan, Talbot & Kaplan, 1988; Ulrich 1984, 1993;
	Possibilities for quiet reflection	Heerwagen, 1990; McCoy & Evans 2005; Barrett & Barrett 2010
	Status conferred by proximity to windows	Duffy 1997
	Beneficial effect of plants & flowers in the workplace	Shibata & Suzuki 2002, 2004; Ceylan, Dul & Aytac 2008 McCoy & Evans 2005
	Complexity of visual detail enhances perceived creativity	
	Impact of light on learning: increased progress (math & reading)	Heschong Mahone Group 1999
	Beneficial impact of sunlight on wellbeing	Hobday 2007
	Impact of daylight spectrum lighting on learning and behaviour in schools	Ceylan, Dul & Aytac 2008; Barrett, 2010
	Warm white light promotes higher illumination, more positive mood and better creative task performance	Knez 1995
	Use of lighting to create spaces for different activities	Alexander et al 1977
	Cooler hues improve concentration in schools	Rea 2002
	Creativity enhanced by less us of cooler colours	Knez 1995; McCoy & Evans 2005
	Colour saturation levels impact on affect	Franz, 2004; Ceylan, Dul & Aytac 2008; Barrett, 2010; Dul & Ceylan 2011
Spaciousness (spatial cognition)	Enclosure as a cognitive construct	Stamps 111, 2005; Stamps 111 & Krishnan, 2006
	Emotional response to spatial openness	Franz, 2004; Franz & Weiner 2008; Ceylan, Dul & Aytac 2008
	Boundary roughness has the effect of increasing apparent size of spaces	
	Impact of colour on perception of size: lighter colours make space appear larger, while darker colours make spaces appear smaller	Mahnke 1996
	Effect of complexity and order on affective response	
	Effect of ceiling height on thinking styles – higher ceilings result in more conceptual thought, lower in more detailed attention	Meyers-Levy & Zhu 2007
Movement	Beneficial effect of walking on creativity	Beatty & Ball, 2011
	Positive sustained impact of aerobic exercise on creative potential	Blanchette, Ramocki, O'del & Casey, 2005
Aliveness • Speech • Thinking • Life (feeling alive) • The I (ego)	Need for a sense of aliveness conferred by built environment	Alexander 1979
	Communication	Steiner, 1916
	Improved communication in enclosed spaces	Allen & Gerstberger (1973); Allen (1977)
	Need for privacy in communication	Weeks & Fayard 2007
	Self-consciousness and self-reflection	Steiner, 1916; Laruelle 1999
	Sociality of senses and sensation in space, sense of disturbance when things are not right	Steiner, 1916
	Sense and signification	Howes, 2005
	Correspondence between positive affect and creative performance	Amabile, Barsade, Meuller & Staw 2005
	Flow in creative performance	Csikszentmihalyi 1975b, 1996
	Presence of symbolic and spiritual elements contribute to feelings of attachment to physical and social environment; aesthetic qualities promote 'strong sense of personal identity and creativity'	Stokols 1992
	Perception of other people and their impact	Steiner, 1916
	The greater the user engagement in the design of spaces the greater the increase of levels of ownership and creative behaviour	Brill et al 1984; McCoy 2000; Killeen, Evans & Danko 2003
	Need to populate spaces with familiar objects and images	Alexander et al 1977

Table 19: Literature on the relationship between the senses, the physical environment and creativity

In the context of this study the aspects of the senses examined are those that are relevant to the interaction between the senses, the physical press or environment, and people's perception and creative behaviours.

Table 19 (above) sets out the literature that links each sense with the physical work environment, and with aspects of creativity and productive thinking. The senses reported by the respondents and contained in Table 17 (page 113) are reviewed in the literature in terms of its direct or indirect impact on creativity, mood or thinking. For example, comfort's subcategories of smell, touch, temperature and air quality each are linked to performance, motivation and affect and hence to creativity (Amabile & Kramer 2010). The literature on the sense of sight that pertains to creativity looks predominantly at the impact of internal and external views, natural and artificial light, and colour. The literature on spaciousness and its relationship to creativity covers the affective response to openness and complexity, the perception of size and the effect of ceiling height on thinking. The sense of movement is examined in research into the beneficial effect of walking on creativity, and of aerobic exercise on creative potential. Steiner's sense of aliveness, with its subcategories of speech, thinking, life, and the I (ego) has a literature that encompasses the communication and creativity link, self-awareness and reflection, flow, and the sense of engagement with working spaces. A full commentary on the literature reviewed is contained in Appendix 16.

The role the senses play in the workplace creativity is also contained in three key papers (see Table 20 below). This role is examined either directly (Barrett & Barrett 2010) or indirectly (McCoy 2005; Dul, Ceylan & Jasper, 2011). Each of the three papers reviews literature pertaining to environments that support creativity, and each structures their findings in different ways. Barrett & Barrett (2010) propose a three-part model for informing the design of spaces: naturalness (that is, people's emotional response to positive aspects of nature, with the example given of clean air), individualisation (how people seek to personalise the spaces in which they work and live) and stimulation (what degree is appropriate to different situations). The paper gives a worked example of a space designed for Alzheimers patients that links elements of the design to each of the three aspects of the model (Barrett & Barrett 2010: 225). The study concludes that design should take into account the user's sensory perception of spaces and how they subsequently behave in those spaces; the paper harnesses neuroscientific insights in doing so.

		Spatial organisation	Architectonic details[19]	Resources	Views	Ambient conditions
McCoy (2005)	**Characteristics of physical and work environments:** Relationship between the physical environment and social behaviour	Proximity to team members; proximity to resources Efficiency of layout Dedicated, shared space Informal spaces Visual access, traffic, visual exposure Multiple places to work: co-location Size of space to fit team and task	Displayed thinking Cues Personalisation Participation in the design process	Accessible technology	Natural or built Intimate or panoramic Restorative value Health-giving affects Status-conferring	Noise/acoustics Comfort - Lighting/glare - Thermal conditions - Air quality - Noise
	Characteristics of work environment: Creative teamwork	Proximity, non-territorial offices Communication, space, layout Controlled privacy Co-location, proximity of workspaces	Display areas Display of personal artefacts	Policy supports team requirements		Crowded chaotic hut
Dul, Ceylan & Jaspers (2011)	**Prior research & case-studies:** Physical work environment/ creativity	Privacy Daylight	Calming colours Inspiring colours Quantity of light	Furniture	Window view to nature Any window view Indoor plants/ flowers	Sound (positive sound) Smell (positive smell)
Barrett & Barrett (2010)	**Prior research:** Sense perception and human response space design	Individualisation	Stimulation		Naturalness	
		Layout - density and pathways Complexity of, and interaction between, sensory inputs	Colour Lighting	N/A	Lighting – daylight & daylight simulation Biophilia	Air quality Acoustics

Table 20: Studies relating elements (including sensory) of the built environment to creativity

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[19] "Fixed or stationary aesthetics of the place, [...] not involving structural organisation (decorative styles, treatment of boundaries, signs, colours and artwork (Becker & Steele 1995)" (McCoy 2005: 181)

As set out in Table 20, Barrett & Barrett structure their review of the literature under their three-part model (individualisation, stimulation and naturalness). McCoy (2005) sets out five aspects of physical work environments that impact social behaviour (spatial organisation, architectonic details, resources, views and ambient conditions), using them as a framework for her review of the literature. Dul et al use their own research findings to structure their review of the literature, and list them rather than structuring them in a conceptual framework.

Dul et al (2011) and McCoy (2005) differentiate between elements of the physical and of the social environment. Dul et al (2011) focus on aspects of the work itself (for example work complexity and levels of challenge) and on the managerial and cultural structure of the organisation (for example degrees of autonomy, interactions with team members, requirement for and recognition of creative ideas towards the achievement of creative goals) (2011: 719). McCoy's work focuses on creative teamwork and gives examples of research that supports a relationship between the physical environment and a) creative teamwork and b) social behaviour. There are examples in each that relate to the other (McCoy 2005: 174, 179). In Table 20 Dul et al's findings (2011) have been set out under McCoy's categories for comparison.

These three texts build a picture of a physical environment in which people are able to move about, to communicate with each other, find quiet spaces in which to think or spaces that stimulate ideas: and to do so in comfort with an appropriate level of noise and ambient conditions.

Lastly in this section, **affordances**, the third element of physical press, with place and properties, is studied. Affordances are those aspects of the physical environment that afford the possibility or opportunity of action independent of people's perception of them (Gibson 1977). In this study affordances are posited as being those elements of the workplace, distinct from the place itself or its properties that afford the opportunity for creative behaviours (that is, those behaviours that facilitate small-c creativity).

The affordances that emerged from the case study data confirmed and deepened those from the professional practice, focus group and interviews. The need for affordances for collaboration is expressed in references to low-tech affordances such as whiteboards, flip charts: "We just had flipcharts all over the place. That's the way I work – I'm very visual. Papered the walls – it was good" (CS3) and other equipment for visualising ideas individually or in a group: "the Category Manager, she'll start chipping in and usually

gets up and sticks post-it notes on the wall and stuff" (R10); and in technological affordances ranging from mobile phone, email: "So we were emailing some thoughts back and forth and we just talked as if we had known each other for 20 years" (CS3), technological collaboration and project management tools, and computers and laptops. The interview data have subcategories in affordances that do not appear in the case study data: relaxation ("[Working] in a very relaxed setting." (R1)), play ("the table football [...] for recreation; [...] a lot of ideas come up as well" (R10), and "I like spaces with lots of technology, lots of equipment, lots of toys, lots of things that I haven't played with before. I go and find those and play" (R9)) and mixing people from different grades and areas within the organisation ("It is really important to get the right mix [of grades]" (R3)).

There are considerable similarities between affordances and place (physical press) and creative behaviours; the subcategories of relaxation, play and mixing people from different areas and grades fall into this overlap. For example, an affordance for collaboration is found in the category of place with meeting spaces of different types. Where an affordance is needed for disengaging briefly by walking, place specifies corridors and other internal spaces for people to move about in. Communication is afforded through technology and also through the layout of offices in open-plan, or in an open-door policy (social press) where there are single offices.

Place and affordances also support some of the properties. A window is an affordance for the properties of natural light, views and fresh air. Storage rooms and filing cabinets within an office space afford the property of orderliness and visual calm. Gibson (1977) states that affordances do not necessarily get noticed or taken up. In Case Study 1 storage rooms, book cases and filing cabinets were provided as affordances for orderliness. The staff did not use them fully, if at all, with piles of paper on the floor, poor access to desks, trip hazards throughout. CS1 comments on the office environment include: "Uninspiring, messy, badly designed, cramped and quite depressing" and "It is cluttered, messy, busy, noisy, uninspiring and often stressful".

Table 21 sets out the affordance elements of physical press as they occur across the case studies. Affordances are common across all the case studies, varying only in particular instances such as the affordances needed for clear information on which desks are available for visitors (CS2) or magnetic walls (CS3).

Affordances (detail)	Case Study 1			Case Study 2	Case Study 3		
	Interviews	Survey	Observation	Survey	Interviews	Survey	Observation
Whiteboard, tech drawings, sketches, process drawings, flip chart (idea visualisation)			X	X	X	X	X
Pin boards, wall boards (display)			X	X	X		X
Metal walls & magnets (display)					X	X	X
Table in room (for informal chat)			X		X		X
Phone (fixed and mobile)		X	X	X	X		X
Internet access (need it to be fast)		X		X			X
Email	X		X	X		X	X
Technological collaboration tools			X	X	X		X
Computers	X		X			X	
Laptop				X			X
Projection screen			X	X	X		
Storage (filing cabinets)	X		X		X		X
Storage (room)		X	X	X			X
Clear information on desk availability				X			
Post-its, paper etc (materials/stationery)			X	X	X		X

Table 21: Affordances elements of physical press compared across case studies

The affordances, as listed in Table 21, support idea visualisation, display (paper and electronic), informal conversations, communication, information retrieval, collaboration (face-to-face and distance), and orderliness (storage).

In terms of this study the affordances are those elements that have been specifically identified in the data as affording the possibility and opportunity of behaviour that facilitates creativity.

The three-element concept of physical press that emerged from professional practice, focus group and interviews is confirmed by the case study data. No modifications were made, rather the categories deepened and saturated. The detail of these three elements has built consistently throughout the data collection in both Data Set 1 (professional practice, interviews and focus group) and Data Set 2 (case studies) and in the analysis of this data using the constant comparator method (Glaser & Strauss 1967; Charmaz 2000).

It is therefore possible to confirm that:

> **Physical press can be defined as comprising three elements: the specific physical place, its properties and its affordances.**

5.3.4   *The creative footprint: case study refinement and verification*

The second Stage 1 finding was that of the creative footprint. The interim definition of the creative footprint is:

> **The *creative footprint* is a set of elements of physical press which together uniquely form an individual's or a group's optimum physical environment for stimulating and sustaining their workplace creativity, in changing situations.**

This section examines the concept's refinement and verification through the case studies and concludes by offering a modified version.

The concept of the creative footprint is looked at from two perspectives: the extent to which it can be observed in the data, and the extent to which the data show that people are aware of their own footprint and those of others.

Looking first at the proposition that the creative footprint can be observed in the data, people in each case study (in interviews, survey responses and observations) were able to identify aspects of their physical press that actively supported their creativity, helping them to come up with creative ideas, and to think well. This could be position of desks: "You are far enough away from other areas, there are quiet areas behind you so you are not always being listened to. But you are close enough to talk to everyone [..] and they will tell you everything you need to know" (CS1) or the amount of light and views: "Very bright – I really like it [...] here we get direct sunlight" (CS1). Other responses include: "Being within walking distance of everyone I need to talk to" (CS3), and "[I have] space for short spontaneous conversations" (CS1). In Case Study 3 thirty-two out of the thirty-seven survey respondents had discussions in their own or a colleague's single office, and twenty-three people would meet colleagues in an informal meeting room. Eighteen people used the formal meeting rooms, and sixteen spoke of chance encounters in the corridors or the canteen. The range of physical spaces described underpins the concept of a creative footprint unique to each individual:

> For getting ideas, for concentrating, I like peace and quiet. I don't like external noise. So sometimes I'll shut the door, and just work away at the desk. Some people like the radio on and things like that – I can't do that. (CS3)

> Helping in the Control Room, after understanding the problem I tend to go into one of the side rooms to view the screens and think alone (CS3)

> The [problems] I'm working on just now you really have to get people involved. Again that is a great office for bringing two or three people in and having a quick meeting. (CS3)

The concept of the creative footprint contains the further possibility that people actively seek out the elements of their creative footprint. However, it was observed that the ability of staff to actively seek out their preferred creative footprint was limited by their role. During the CS1 observation non-creatives in the advertising agency were observed as constrained within their designated work area either by the affordances of the job (computer screen for Studio, files and computer screens for Finance) or by its necessities. One interviewee from Finance, whose job needs continuous attendance at her desk and computer, would have preferred to work in a quieter and more organised space but had to accept where she was located: "I put my headphones on – shuts the world out. Anything to get rid of these people talking [around my desk]". An account manager, while knowing that management encourage physical movement within his role, was unwilling to move from his desk because of the demands of one client who

"expects me to be there whenever they call", so his lack of ability to actively seek out his creative footprint was self-imposed. On the other hand the creatives (those members of staff whose job directly entails producing big-C creative ideas for clients) had free rein to work wherever they wanted "as long as you get the work done". They were observed, and confirmed in interview, being able to leave the company building for coffee shops, restaurants, home, bike rides, galleries – whatever and wherever they felt sparked their creativity : "It is very productive to work off-site [...] I go to shops and pick up stuff because it is a bit different. Art galleries, walking around, going in shops, [...] scanning" (CS1).

CS2 respondents were aware of the aspects of other people's behaviour that detracted from their own ability to work well and creatively: "People do not respect other people's space as they just chat to you even though you are busy doing something" and "[I would prefer] no team meetings round desks [as they are] disruptive". They also spoke of the need for the ability to have informal conversations with colleagues "about what they are doing, progress, problems etc." The survey responses indicated a tension between the need for networking and the need for quiet concentration: "The actual office space doesn't feel like an area where you are supposed to be 'networking' in. [...] You are given the sense that you're breaking the rules" (CS2).

With the exception of one CS1 interviewee, who had arguably one of the best-placed desks in all the case studies (beside a window looking out over the water) all interviewees were aware of the physical press characteristics that detracted from their ability to think well and creatively, citing other people's noisy conversations, music and interruptions as key distractions: "too much noise for thinking"; "crowded, noisy"; "crowded, no privacy, lots of distractions" (all CS1). This was coupled with a lack of quiet spaces for concentration or informal meeting spaces away from the working areas. In contra-indication to this data, another detraction cited by one interviewee was isolation – a lack of contact with other people. This person, however, was unusually working as a solo creative, rather than being in a team.

The proposition that staff make adjustments to their physical press to minimise its hindrances to creativity is not supported by the data in any of the case studies; none of the interviewees or the survey respondents made any reference to actively changing their physical press to improve it. In response to the survey statement: *I can change my immediate environment if I want to, to suit my preferences and needs*, twenty-nine out

of thirty-eight CS1 respondents scored it at 2 or below on the Likert (1932) scale where 0 = not at all and 4 = very much. In CS2 ten of the twenty-one people who responded to the same question marked it as 0 or "Not at all", while a further ten marked it as 1 or 2. Instead, people's reaction to creativity hindrances (the issues of noise and distraction etc within the space) confirmed that their preference was to move to a different location that they found supported their creativity, either inside or outside the building. CS2 respondents reported informal meetings held at the back of the office, in the canteen or the internal Costa coffee shop: "The chance to disappear for a coffee at Costa is great for an informal chat." They used their remote working spaces and the journey to and from work by bus, train or car to do their thinking in, and within SAH they used the Touchdown area or the Learning Centre.

It can be argued from the CS1 and CS2 data that people in the study were aware of their creative footprint and of the kinds of space (and its properties) that both enhanced and inhibited their creativity; they avoided unhelpful space by moving elsewhere when possible, or by cutting off in whatever way was culturally allowable where they could not physically move. They did not perceive that they could make modifications to their workplace, but when modifications were made, were aware of the impact upon them. The CS3 survey differed from those of CS1 and CS2 in that it addressed the kinds of spaces needed for different stages of the creative process, and whether those creative process stages were done solo or with others. Each of the ten interviewees and the thirty-seven survey respondents were able to articulate their needs in terms of places for activities. Twenty-eight of the thirty-seven survey respondents, when tackling a work problem, started on their own: "Start off on own using experience and reference material then ask colleagues". When in the middle of the problem they worked with others face to face or virtually: "Most problem solving will involve at least two people. The more input the better", and continued working in collaboration with others when in the final stage of solving the issue. They also spoke about mixing solo and group throughout the process "All of the above! Usually try and solve myself then bounce it off knowledgeable colleagues". The respondents were aware of their own creative process and what they needed in terms of creative behaviours at each stage.

Over the course of the different data collection stages the central concept of the creative footprint has remained constant, and has been successively validated. There has, however, been a modification in understanding how people deal with restrictions to their preferred creative footprint. There is a distinct difference between Stage 1 data

which reported that people will seek out their own creative footprint, and avoid or seek to change aspects that hinder their creativity, and the subsequent understanding that where people cannot avoid a hindering physical environment they will cut off from it to the extent that the work culture permits, and will rarely seek to change the environment. This, it is suggested, directly reflects the amount of autonomy each person has at work. The greater the capacity for self-determination, through self-employment, being in a senior position in the company, or the company having unusually flexible working practices (as was the case for nine of the eleven Stage 1 interviewees) the greater is people's awareness of how the physical space impacts not just their own creativity, but the creativity of others they are working with. The acutest awareness of other people's creativity was when interviewees were reporting interactions with clients, both internal and external.

Where people did not perceive they had any permission or capacity to change their environment they used internal coffee shops or canteens, cut off from it through headphones or staring out of the window, and directed their dissatisfaction outward towards colleagues who imposed their own (usually noisy) behaviour on others.

The modified definition of the creative footprint is:

> **The creative footprint is a set of physical press elements which together uniquely form an individual's or a group's optimum physical environment for stimulating and sustaining workplace creativity, in changing situations. Where their creative footprint is not supported, people will seek out somewhere else to work or cut off from their surroundings in whatever way is culturally permissible.**

The concept of the creative footprint and employees' concomitant awareness of their own creative footprint and those of others, is an important one. If it can be said that each person is distinctive in the way he or she thinks creatively and has specific needs, then it is not possible to design a workplace round narrow parameters of 'support for creativity' and expect that design to enhance the creativity of everyone in the workplace. This observation is important to this study as a basic premise of the grammar of creative workplaces: that workplace design should support the creative footprint of each person working there.

5.3.5 The engage/disengage model of creative behaviours: case study refinement and verification

Finally, the third finding to emerge from Stage 1 was the engage/disengage model of creative behaviours.

Engagement		Disengagement			
Deliberate engagement with people, information & ideas	Chance engagement with people, information & ideas	Disengagement from others & context through physical movement	Disengagement from others & context through mechanical movement	Disengagement from the issue or context through short distractions	Disengagement from others, the issue or context through longer periods of time

Table 22: Summary of data categories of behaviours that stimulate, sustain and support workplace creativity

Table 22, reproduced from Section 5.2.3 page 99 (Table 12) of this chapter, summarises the behaviours identified in each part of the engage/disengage model of creative behaviours.

In order to refine and verify the model it was decided to use data in a form that had hitherto been subsumed into the larger data sets: respondent diagrams. Eleven in total, these were made by subjects from the professional practice, the interviews and a second focus group (FG2) which had been convened to test elements of physical press and is fully discussed in Chapter 6.

The eleven diagrams (given in full in Appendix 15) analysed were made by research subjects, or by the researcher during the interview and approved by the interviewee, to illustrate the research subjects' own creative processes. During the semi-structured Stage 1 interviews the interviewees, all with an organisational background, were encouraged to describe and draw their own creative process. Focus group members, practicing artists from a variety of disciplines, drew their creative processes, both big-C and small-c. They illustrated their process by adding cards designed as part of the test process (see Figure 20, page 128). The creative process diagrams of two professional practice interviewees were also analysed.

The eleven creative process drawings were analysed using the constant comparator method (Glaser & Strauss 1967). This enhanced understanding and helped to refine and verify the engage/disengage model. During the different data collection stages it became clear that each respondent had – and could describe – their own unique creative process. While the processes people drew incorporated many elements of formal creative process models, they each differed in which elements came forward and in

what order. The drawings described how the people and their processes responded to different situations and contexts thus enriching the concept of the creative footprint. Diagrammers also added further elements of their own: circadian rhythms and play. While robust research models of individual and group creative processes exist (Chapter 2: Literature Review) it can be argued that each person has their own unique process both in its content and the sequencing of that content.   Figures 18-21 show four of the respondents' diagrams and attendant quotations, ranging from a metaphor of fireworks in Figure 18, to Figure 19's more prosaic verbal description, to the dynamic loops in Figures 19, 20 and 21.

Although each diagram is unique, they illustrate the different creative process stages discussed in Chapter 2, Table 3 (page 17). Each person, for example, has a preparation phase (Wallas 1926; Evans & Russell 1989). The junior sales executive (Figure 19) thinks through her problem before approaching other people; the retired engineer (Figure 21) thinks things through before having "a conversation with a maker" (in the sense of craftsperson) or a reflective conversation with himself in his "private chat book". The film director (Figure 18) studies the script, the film's "firm root", before working with actors, designers and film crew.
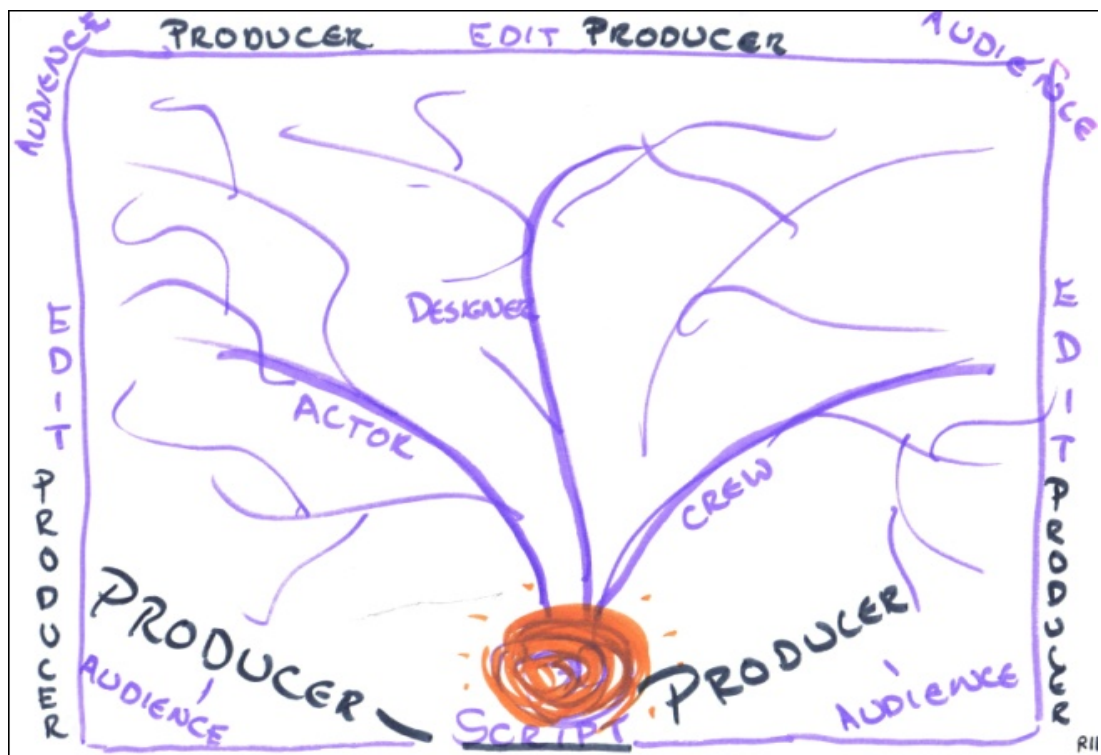
Figure 18:   Film Director's creative process

"There's loads of different stages for me. Things going off [like fireworks]. [...] Always a firm root [...] which would be the script. [...] That allows you to be spontaneous." (R11)
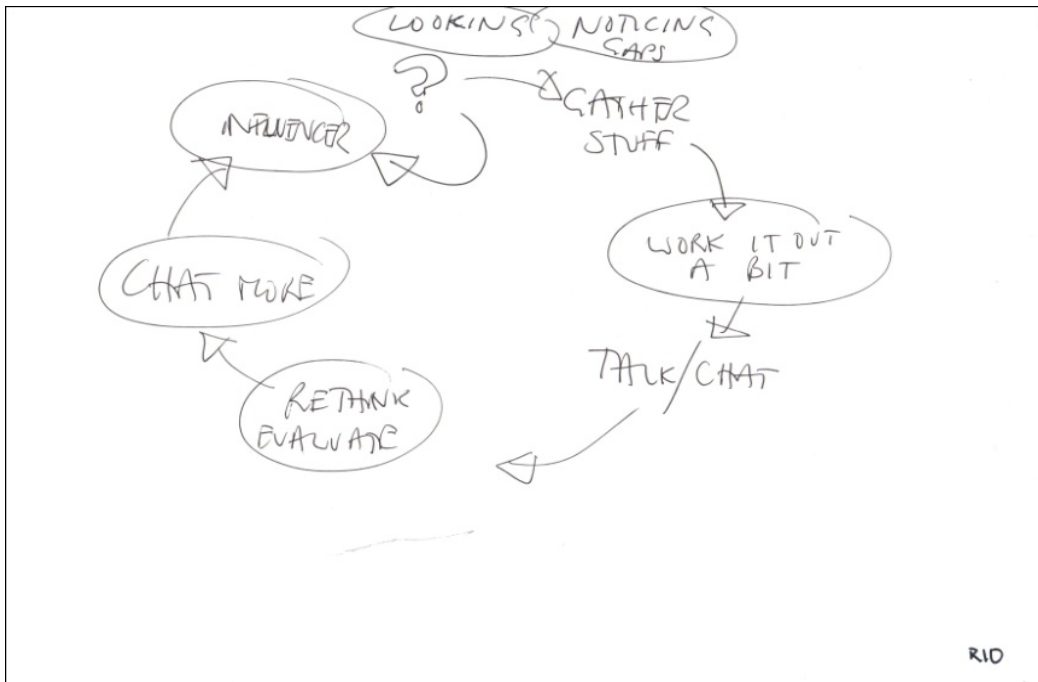
Figure 19: Junior sales executive's creative process

"Before I [talk it through] I tend to work it out a bit, add a bit more like flesh to it, so I've got an idea of what I'm talking about. [...] And then I'll start talking to people. [...] It's probably a lot of chatting and rethinking." (R10)
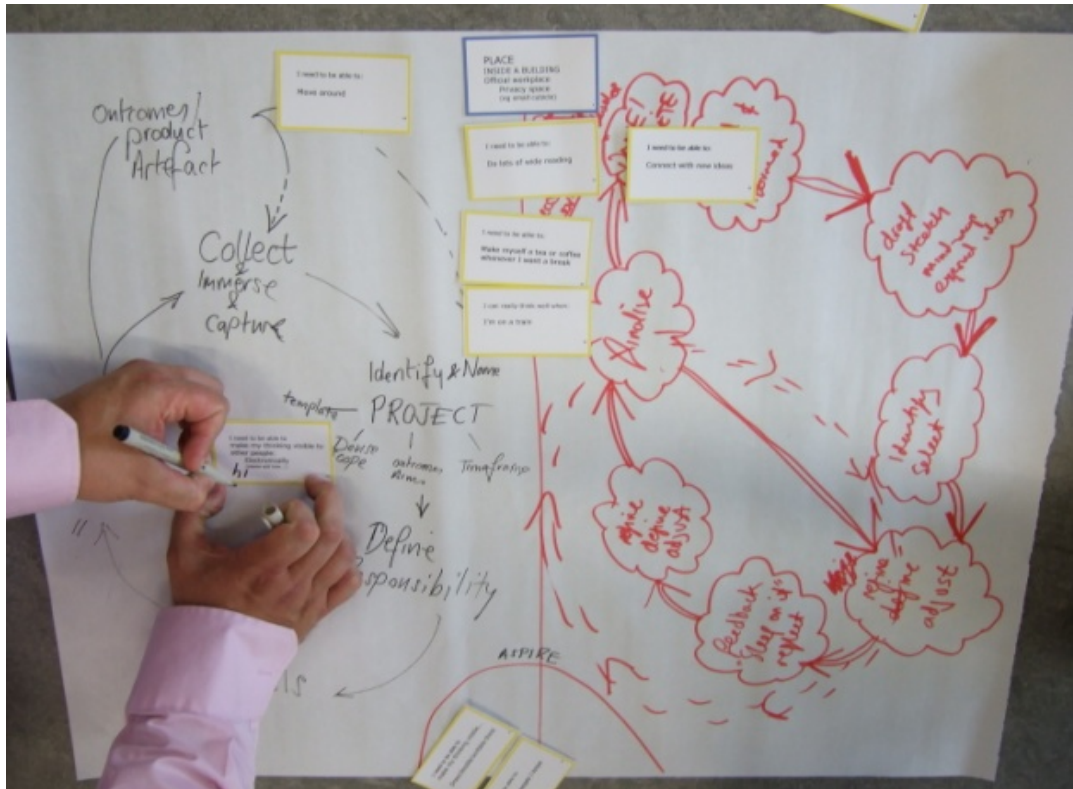
Figure 20: Creative processes of two focus group members
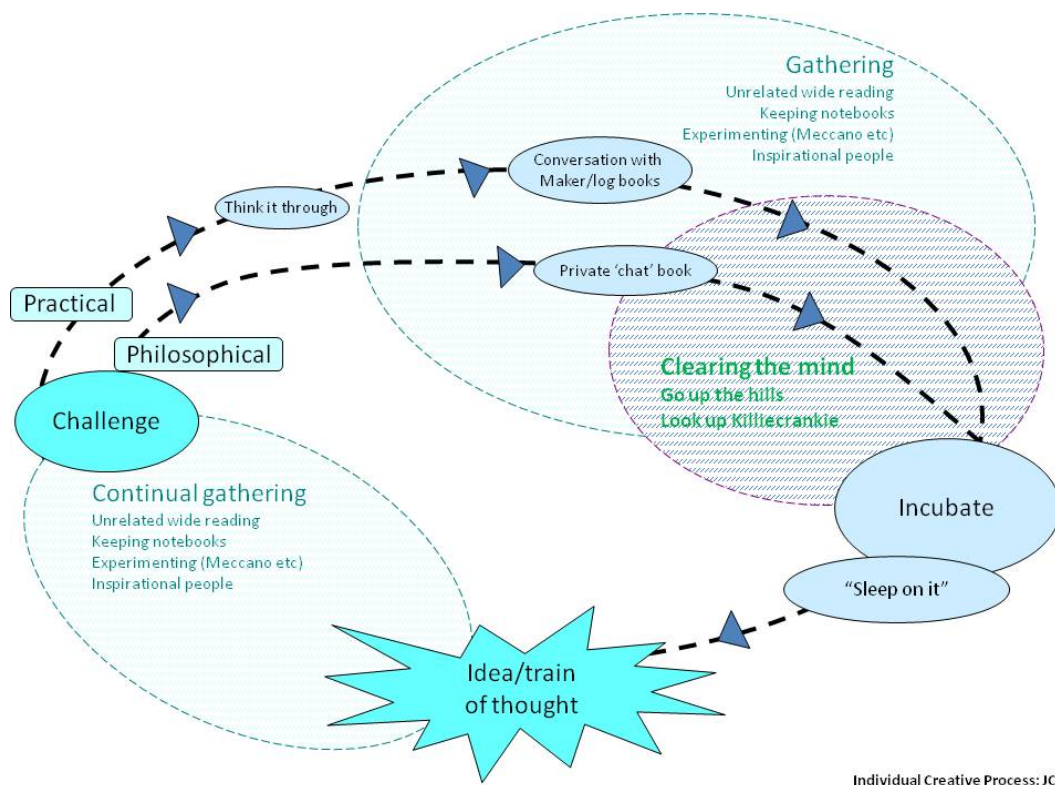
Figure 21: Retired engineer's creative process (professional practice)

"[I get ideas by] reasoning: working with a challenge to get something right. There are two separate fields: making, devising something mechanical, physical; and understanding why things are as they are. Both are enhanced by the early morning, especially the second. I don't mix them up." (Professional practice respondent)

Each diagram (Figures 18-21 and Appendix 15) also illustrates an iterative process between solo thinking and collaborative thinking. This understanding of an iterative creative process (Laseau 1975, 2001; Sawyer 2003; Resnick 2007) present in each person's creative process is important in the refinement of the engage/disengage model of creative behaviours. It demonstrates the need for behaviours of engagement and disengagement at different stages in an individual creative process.

It is suggested that each creative process stage, from whichever creative process is being described (Table 3, page 17) is made up of a series of behaviours. Although models of the creative process may look tidy the actuality is far from being so. Researchers often acknowledge this: Csikszentmihalyi (1996) warns against taking a 'classical analytic framework' too literally, saying that it gives 'a severely distorted picture of the creative process' and Resnick (2007) observes that 'in reality, the steps in the [creative] process are not as distinct or sequential as indicated in [my] diagram'. For example, Wallas illustrates his incubation stage with a contemporary mathematician's injunction to be in a state of 'actual mental repose for all or part of his brain' (1926: 94). Evans & Russell (1989) discuss the need for multiple redefinitions of a problem at the preparation stage,

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and Tatsuno (1990) references the infrastructure put in place by the Japanese Ministry of International Trade and Industry (MITI) specifically to nurture idea-generating in environments that facilitate creativity. Thus, the creative behaviours described in the respondents' diagrams are all part of their own creative process. The eleven creative process drawings generated twenty-eight different behaviour categories, twenty-five of which had two or more different subcategories (see Table 23 below).

Creative behavior categories	Times referenced	Respondent quotations
Think	3	"Let the ideas moulder around"
Generate ideas	2	"Generate ideas – blue sky thinking [techniques]"
Write	3	"Hand-activated documentation"
Reflect	3	"Ideas emerge"
Sleep	3	"Sleep on it"
Dream	2	"Flow, disconnect, daydream"
Travel	5	"[I think well] in the car on my own"
Solo activities	4	"Go to the hairdresser"
Move about	3	"Walk the hill" "Be in the mountains/countryside/ by water" "Move in the city/urban setting" "Swim"
		References to disengaging behaviours: 28
Speak to experts	7	"Talk to the designer, the actors and the crew [on film set]"
Interesting conversations	4	"Share thinking and inspiration"
Make thinking visible to others	3	Face to face HTML/electronic
Across disciplines	4	"Working with colleagues" "Bump into people"
Gather	7	"Gather stuff" "Wide reading" "Gather unrelated information [from a variety of sources] "
Collect	3	"Collect, immerse and capture"
Sample	1	"Identify/select"
Scan/Be aware	2	"Notice" "Look for gaps"
Browse	1	"Browsing"
Try things out/ Working out	8	"Refine/define/adjust" "Test in iterative process" "Work it out a bit"
Rethink	5	"Hear my thinking [by talking to others]"
Evaluate	4	"Test ideas" "Reduction of possibilities"
Review	2	"Review with influencer"
Craft	1	"[Film] editing"
Build a project	2	"Create and scope a project"
Chance	2	"Authentic randomness"
Encounter the new	3	"[Encounter] novel, unique situations"
Encounter the unexpected	3	"Dislocate from routine" "[Connect with] the unfamiliar"
New categories	4	"Be playful" "Time – temporal – day and night"
Total number of categories: 28		**References to engaging behaviours: 66**

Table 23: Categories of creative behaviours derived from eleven respondent diagrams and drawings

Creativity in work takes many forms. The data in Table 23 divide into disengaging and engaging behaviours. Examples of disengaging behaviours include: "Let the ideas moulder around" (professional practice respondent (PPR)), "[I think well] in the car on my own" (R1), "Walk the hill" (R11) and "Sleep on it" (PPR). Examples of engaging behaviours include: "Share thinking and inspiration" (focus group (FG2)), "Test in an iterative process" (FG2) and "Review with influencer" (R10). Some of the engaging behaviours are when people report engaging with information and ideas. These can happen individually as well as collaboratively; "gather stuff" and "wide reading" are behaviours in which people engage with information and ideas and can be done individually or with others. The literature review (Chapter 2) discussed how research focusing predominantly on individual creative people has been extended to include work on group creativity. This is also evident in Table 22 where, across the eleven diagrams and drawings analysed, there are 28 references to disengaging creative behaviours against 66 references to engaging creative behaviours.

Some of Table 23's creative behaviour categories correspond directly to phases identified in existing creative process models (Table 3, page 17). Working out, for example, is the final phase of Evans & Russell's model (1989) and is implicit in the final stage of models by Wallas (1926), and Tatsuno (1990). Sleep appears within incubation stages (Wallas 1926; Evans & Russell 1989) rethink and evaluate in the final stages of many models (Wallas 1926; Evans & Russell 1989; Tatsuno 1990) and play and reflect are stages of Resnick's spiral model (2007). There are indirect correspondences between the categories and existing creative processes: think ("Let the ideas moulder around") and movement are resonant with incubation, and scan/be aware echo Wallas' (1926) preparation stage. Each of the diagrams illustrates opportunities to share ideas and information with others, particularly in the categories of speak to experts, conversation, make thinking visible to others, sample, review, craft, build a project, cross-discipline, new, unexpected, and play. Each person, whether from a background in the arts or in organisations, at some stage of their creative process shares their thinking with others. The processes drawn by respondents always describe a flow between one individual and others whatever kind of creative behaviour (big-C or small-c creativity), or whatever the desired outcome (business solution, producing ideas or an art concept or object). Only one respondent, a retired engineer working on solo projects (Figure 21 above), had a single shared process: three respondents had 2 shared processes, two respondents had 3 shared processes, three respondents had 5 shared

processes, one had 6 and the last had 9 shared processes. This flow of sharing is iterative, building ideas. Laseau talks of "a continuous cycling of information that undergoes transformations at each communication point" (1975: 18) and "the more the information is passed around the loop, the more opportunities for change" (2001: 8). Laseau is speaking from his design perspective of sharing ideas visually (indicated in four of the eleven diagrams as important), but the concept also resonates with the share stage in Resnick's (2007) spiralling process, and Sawyer's synchronic interaction (2003) between ideation and evaluation. Categories of solo activities were mentioned twenty-eight times in the drawings, while categories of shared or collaborative activities appeared sixty-six times, reflecting the prominence that each respondent gave to shared or collaborative activities in their creative process.

Analysis of respondents' diagrams, therefore, suggests that individuals engage in multiple ways with ideas, information and people in order to stimulate and sustain their own creativity and that of colleagues (Dunbar 1997), and disengage from the issues, or from others and their environment in order to engage with their own cognitive and internal creative processes (Claxton 1997). The analysis of these drawings confirms the underlying framework, emerging from Stage 1, of engagement with ideas, information and people, and of disengagement from the issue, from other people and from environment either to "refresh the mind" or to engage cognitively with one's own thinking. This section concludes that it can be demonstrated that individuals each have a unique creative process which they can describe; that the disparate creative processes are linked by common creative behaviours; and finally that, while parallels exist between individual and existing formal creative process models, diverse individual creative processes can more usefully be modelled as a collective meta-form in the engage/disengage model of creative behaviours. The detailed analysis of eleven creative process drawings thus deepens understanding of an engage/disengage model of creative behaviours.

5.3.6 *Emerging common elements of creative workplaces*

The elements common to creative workplaces that emerge from Stage 1 are those of physical press, the creative footprint and the engage/disengage model of creative behaviours. Examined through the lens of Stage 2's three case studies they were found to be robust. It can therefore be posited that the common elements of creative workplaces are:

a) Physical press's three constituent elements of place, properties and affordances

b) The engage/disengage model of those creative behaviours that are undertaken by people working in creative workplaces.

Underpinning these elements is the third finding: c) the creative footprint, unique to each person and varying dependent on task and situation.

5.4 Emerging hypothesis of a grammar of creative workplaces

It is at this point that a further hypothesis emerges from that data: if it is possible to identify the key common physical elements in the workplace that stimulate and support small-c creativity, and if these elements can be structured through the engage/disengage model of creative behaviours and the definition of physical press, these elements and their structuring could be said to create a visuospatial patterning or grammar. This emerging hypothesis is also informed by the literature of Pattern Language (Alexander et al 1977; Alexander 1979), Space Syntax (Hillier & Hanson 1984) and shape grammar (Stiny & Gips 1972), reviewed in Chapter 2.   Chapter 7 sets out the hypothesis in depth. For the time being the elements of the hypothesis and its attendant literature are given in overview only.

As reviewed in the literature of grammars, (Chapter 2, Section 2.4, pages 30-39) both linguistic and non-linguistic grammars are most often composed of the three elements of *lexis* (the component parts of the language, its vocabulary), *syntax* (the rule set that governs the ordering of the lexis), and the *meaning* that is created from that ordering (Chomsky 1957; Lyons 1970; Thomas 1993). As the data categories in this research project emerged, so it became apparent that a pattern was forming in which the data categories paralleled these three grammatical elements.

As has been seen in the previous sections of this chapter, respondents identified the creative behaviours that stimulated and sustained their creativity, and the discrete physical elements that influenced and supported (and could hinder) those activities.   It is suggested that those creative behaviours and their associated discrete elements of physical space are congruent with the elements of a grammar. The literature reveals multiple examples of visual (non-linguistic) grammars where the lexis of the grammar consists of physical elements as diverse as landscape (Mayall & Hall 2005, 2007), windows (Rollo 1995) and bodily movement (Laban 1963, 1966). The literature on non-linguistic visuospatial grammars also describes the visuospatial equivalents of

syntax, for example Euclidean transformations (Stiny 2006), axial lines and isovists (Hillier & Hanson 1984) and the Golden Section (Sass 2007).

I argue that the elements that make up physical press: the place itself, its properties and its affordances, are the equivalent of a grammatical lexis; and that each data unit in place, in properties and in affordances can be posited as corresponding in function to that of a word or phrase in a linguistic grammar.

Non-linguistic grammars have dynamic syntaxes that order their respective lexes. I further argue that the syntax of such a hypothetical visuospatial grammar is formed by the engage/disengage model of creative behaviours and that this model forms a dynamic structure for the ordering of the lexical elements of physical press (place, properties and affordances).
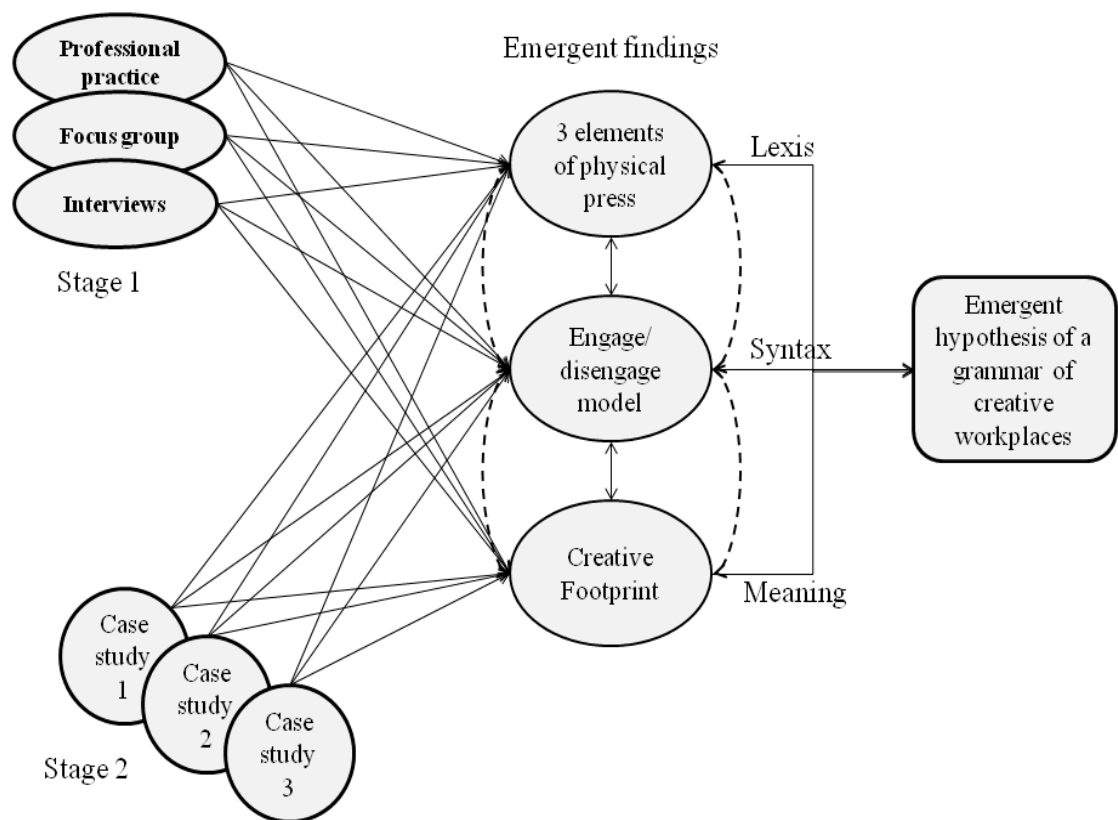
Figure 22: Findings from Stages 1 & 2 supporting the emergent hypothesis of a grammar of creative workplaces

Thus, Figure 22 demonstrates how the findings, emerging from Stage 1 and refined in Stage 2, are each equivalent to an element of grammar. The three elements of physical press (place, properties and affordances) are the lexis; the engage/disengage model of

creative behaviours is the dynamic syntax; and the creative footprint is the meaning that results from the ordering of the lexis through the syntax.

Exploring the *lexis* first, the literature, supported by the data, has demonstrated that physical space has a mediated impact on people's ability to be creative in the workplace. In the case of a grammar of creative workplaces its lexis or component parts, is, I suggest, composed of the elements of physical press: place, properties and affordances. These three elements were examined in detail earlier in this chapter. Summarising, place is seen in terms of inside/outside a building, workplace/non-workplace, formal/informal, types of layout and of non-workplace function (domestic, public, commercial and transportation). Properties is categorised in terms of its sensory characteristics, with Aristotelian, neurological and Steinerian senses emerging as six core categories of comfort, sight, sound, spaciousness, movement and aliveness. Affordances are those tools and equipment that actively support people's creative behaviours in the workplace.

Looking next at syntax, I suggest that the syntax or rule set that governs the ordering of the lexis is composed of the two main categories of creative behaviour: engage and disengage. For example, in their paper on landscape grammar Mayall & Hall discuss their study of how 'grammatical rules can be defined to take objects from a landscape vocabulary, relate them to each other, and arrange them into patterns that describe a certain landscape character' (Mayall & Hall 2005:896). They inventory the elements of landscape, and analyse their configurations so that the findings can be generalised. Mayall & Hall use three constituent parts for their landscape grammar (LG): the vocabulary of landscape parts (trees, buildings, fence and so forth) (V), the set of rules (R) that expresses the spatial relationships between those constituent parts, and the initial scene (IS) which acts as a model or embodiment of the character of the landscape being modelled. Thus, $LG = \{V, R, IS\}$. Chapter 7 describes how a syntax of engage/disengage activities might order a lexis of the elements of physical press, drawing on parallels with Mayall & Hall and other visuospatial grammars, and with linguistic grammars.

The last element of grammars (linguistic and non-linguistic) is *meaning* which emerges from the ordering of the lexis by the syntax. Thus the words on this page (lexis) are ordered (by syntax) so as to create a communicable meaning. The grammatical correctness or grammaticality of a linguistic sentence is (with the exception of syntax-

neutral grammars, discussed in Chapter 2) dependent on its ability to convey meaning. I propose that in terms of the creative workplace meaning is the quality of creativity support that the physical environment delivers for its users.

Meaning emerges in the data as affective (Russ 1993) statements, as, for example (quoted earlier) the Regional Health Service Manager, describing an office where she had previously worked:

> [T]he impact that that [office] actually had on you physically, psychologically, creatively, is amazing. You can actually feel – it's as if your whole body just slumps … there's a slight slump. Whereas now, I'm finding that there is actually --- shoulders back, chest out, head high, moving forward. So [the physical environment] just impacts. (R1)

People reported their emotions throughout the Stage 1 interviews (see Table 24 below).

Categories of emotional needs reported by R4	Emotional needs reported by Stage 1 respondents
"To make sense of life, the universe and everything"	Wholeness – how to bring wholeness to what you do Trust – self, trust feelings
"[To have] values and be valued"	Being valued makes the ideas flow Feeling valued and thought about in a space Appreciation [means giving] understanding and time
"To speak to the heart"	Aligned people [...] feed the intellect and emotions; nobody's behaviour will force me into anything I'm not prepared to look at You [...] are a thinking, breathing, living, loving thing Grace – people respond to it
"Aspiration"	[T]he nature of life – determination takes me uphill; fear takes me downhill [riding a racing bicycle] Let's try again: resilience Feeling competitive – motivated to improve things
"Awareness of expectations, possibilities, opportunities"	All thoughts are metaphors, we just don't know what they are yet Flow is wonderful Creating, rummaging – it's an attitude to life
"Feeling, sense, passion"	Now [with permission and empowerment] it's 'shoulders back, chest out, head high, moving forward' We are not machines, we are biological systems Not moaning all the time – interpersonal relationships are better
"Identity (not brand)"	Don't like rules I'm a bit of a non-conformist'
"Wide open mental spaces [can mean I am] scared"	Fear: overcoming it is the challenge Fear: how to let go, and make judgments Tension: between determination/tenacity and fear

Table 24: Emotional needs as identified by Stage 1 interviewees

R4, an independent management consultant, was particularly articulate. His descriptions of his emotional needs form the analysis categories in Table 24 (left-hand column). Each category holds affective data collected from across all the interviews (right-hand column) organised by their resonance with R4's individual needs. Feelings of assigning value and being valued, trust and wholeness are reported to be significant for respondents. Developing strong interpersonal relationships and strong intrapersonal skills such as resilience, motivation, letting go of tension and overcoming fear are also valued; as is people's ability to personalise their workplace.

I suggest that affective support for creativity in the workplace is a key aspect of meaning in the context of an emerging grammar of creative workplaces. This sits within the interaction model of creative behaviours as a core constituent of the independent variables of people and of social press (Chapter 3), and as a significant contribution to the intervening variable of perception.

Work by De Dreu, Baas & Nijstad (2008) has made strong links between mood and creativity, where mood tone (positive or negative) is seen to impact the kind of creative behaviour exhibited and hence the creative output achieved. Their work looks at a 'dual pathway' to creativity, where a positive tone leads to cognitive flexibility and inclusiveness, and a negative tone (anger) leads to persistance and perseverence. Wang, Xue & Su (2010) describe the impact of positive mood on supervisor creativity, while Amabile, Barsade, Meuller, & Staw (2005) and Davis (2009) explore the positive relationship between positive affect or mood and idea generation. The data in Table 24 (above) suggest that when workplace users' emotional needs are met, this contributes to the meaning they find in their workplace.

5.5 Conclusions

This chapter has set out the findings from two research stages: Stage 1 comprising professional practice, focus group and interviews, and Stage 2 comprising the three case studies. The chapter examined, firstly, the data categories emerging from the three parts of the first data set. Then the chapter looked at the emergence from those categories of the interim findings: a) the definition of physical press, b) the concept of the creative footprint, c) the model of creative behaviours, and d) the emergence of common elements of creative workplaces. Then the first three of these emergent findings were examined against the case studies, and it was found that the case study data enriched and extended each of the three findings (physical press, creative footprint, model of

creative behaviours). The final finding – that it is possible to identify the common elements of creative workplaces, and the emergent hypothesis of a grammar of creative workplaces – has been examined against the data categories from which it had come forward, linking it to the emotional needs expressed by respondents in the interviews in particular.

The findings of physical press, creative footprint and the engage/disengage model of creative behaviours have been situated in relation to the emerging hypothesis of a grammar of creative workplaces and its structure. It is suggested that the elements of physical press identified by respondents in all the data sets may comprise the grammar's lexis, the creative behaviours model of engage/disengage may form the grammar's syntax, and the data categories of emotional needs and responses (underpinned by the interaction model of creative behaviour) may carry the grammar's meaning.

The next chapter examines, through a test phase (Stage 3), the robustness of the proposition that the identified elements of lexis, syntax and meaning do indeed stimulate and sustain user creativity in the workplace.

Chapter 6: Testing the grammar of creative workplaces

6.1 Introduction

The previous chapters have described the emergence of the grammar of creative workplaces from research Stages 1 and 2's data collection and analysis, and findings refinement and verification. The literature on linguistic and visuospatial grammars and on grammatical meaning has also been explored in the literature review. This chapter presents Stage 3 of the research. It introduces the test form of the grammar of creative workplaces and describes how it was developed from a prototype. The chapter reports how the grammar's content and method (design, means of evaluation and ease of use) were tested.   The chapter then reports on the refinements made to the grammar through the iterative test process, and finally discusses its accuracy.

As described in Chapter 4, Section 4.4, page 82, the testing sought to answer the question of whether the grammar of creative workplaces could accurately assess the ability of a physical workplace to stimulate, sustain and support the creativity of people working in it. The test studies were therefore designed as workplace evaluations using the grammar as an assessment tool. The tests generated and compared two data sets: 1) what the grammar said about a specific workplace and its ability to stimulate and sustain creative behaviour, and 2) how the people using that workplace perceived its ability to stimulate and sustain their workplace creativity.   The first data set (what the grammar says about a workplace) was collected by an independent assessor using the grammar; the second data set (what the users say about a workplace) was collected by the researcher through semi-structured interviews with a random sample of workplace users.   This section describes and examines the tests through their stages of a) independent grammatical assessment of the case study workplace environments, b) interviews conducted with people using those workplaces, and c) the subsequent comparison of the two resulting data sets. The emergent findings are then described.

Table 25 sets out the aims, method and findings of Stage 3 in relation to the previous two research stages.

STAGE 1		STAGE 2		STAGE 3	
Aim: • *Data collection and analysis*		*Aims:* • *Verification & refinement of Stage 1 findings* • *Collection & analysis of additional data*		*Aims:* • *Testing the emergent grammar's content, method & accuracy* • *Collection & analysis of additional data*	
Method	**Findings**	**Method**	**Findings**	**Method**	**Findings**
Professional practice	Physical press definition	Three case studies:	Stage 1 findings verified, and some refinements and additions made	Focus group for testing content ⇩	Additional elements added ⇩
Interviews	Creative footprint	Advertising agency Government dept. Engineering co.		Three studies for testing prototype method	Layout design changed
Focus group			Emergent grammar of creative workplaces		Test scale changed from Likert to semantic differentiation
	Engage/disengage model of creative behaviours				Test method altered ⇩
				Two studies for testing accuracy:	Grammar accuracy verified
				Engineering co. Financial Services	

Table 25: 3-Stage research process, Stage 3 highlighted

As described in Table 25 (above), before the final testing for the grammar's accuracy could be carried out, its content (lexis and syntax) and method (design, evaluation and ease of use) were tested. The content was tested through a focus group and additional elements of the lexis subsequently added to the grammar. The method was tested in three studies using a prototype grammar. As a result of this, the grammar's method: its layout, design and evaluation scale, was modified. Once these modifications had been made to the grammar, a refined version was tested for accuracy in two organisational studies.

6.1.1 Structure of the grammar of creative workplaces

As described in Chapter 5, Section 5.4, page 133, lexis, syntax and meaning are the three grammatical elements common to linguistic and non-linguistic grammars (see also Chapter 2, Section 2.4, page 30). All three grammatical elements emerged strongly as data categories from the professional practice, interviews, focus groups and case studies of research Stages 1 and 2. These elements are summarised here in Table 26 as meaning (pragmatic and contextual), lexis and syntax.

MEANING	LEXIS	SYNTAX
Pragmatic & contextual: to stimulate, sustain and support everyday creativity in the workplace	Physical press: - Place - Properties - Affordances	Creative behaviours (deliberate & chance): Engagement with - People - Information - Ideas Disengagement from people for cognitive engagement with - information - ideas Disengagement from the issue for refreshment and incubation

Table 26: Structure of the hypothesised grammar of creative workplaces

Pragmatic meaning is used here in the sense of the relationship between the elements of a grammar and their meaning within the external context (Chomsky 1957; Lyons 1970; Thomas 1993) as opposed to semantic meaning, the association of words with their meaning (Vigliocco 2000). That is, the extent to which, in the grammar of creative workplaces, the relationship between the elements of lexis (place, properties, affordances) and syntax (creative behaviours) forms workplaces that stimulate, sustain and support users' creativity (meaning).

The grammar of creative workplaces is presented as an instrument to assess the ability of a workplace to stimulate, sustain and support its users' everyday creativity. Thus, the meaning that the grammar seeks to discover and inform is pragmatic and contextual – the ability of a workplace to facilitate creativity. The proposed grammar does this through its lexis and syntax. The proposed lexis is composed of the three parts of physical press, that is, place, its properties and its affordances (Chapter 5, Sections 5.2.1 page 91, and 5.3.3 page 108), ordered by the proposed syntax of the engage/disengage model of creative behaviours (Chapter 5, Sections 5.2.3 page 97 and 5.3.5 page 126). These elements were tested for sufficiency in the focus group, and for accuracy in the workplace tests.

6.2 The grammar of creative workplaces: Version 2.0

The final version of the grammar is presented here to situate the discussion of the test stage. The grammar of creative workplaces was developed in phases: the individual elements were identified and a prototype version (V1.0) was written, tested and modified to produce a final version (V2.0). This was then tested. Thereafter the theoretical grammar was developed. The grammar's sequential development up until the theoretical version is described in this chapter; the theoretical grammar is set out in Chapter 7.

V2.0 of the grammar is presented in Figures 23, 24, 25 and 26, set out over the next eight pages. Each element corresponds to the constituent parts of lexis (place, properties, affordances) and syntax (creative behaviours). The grammatical element of meaning was tested through user interviews, explored later in this chapter.

Each grammar element has two pages, colour-coded for ease of use. These eight pages (Figures 23, 24, 25 and 26) present the whole grammar of creative workplaces. The eight pages were printed and bound for the independent assessors in the grammar's Final Test. Commentary on each grammar element is made in the sections following Figures 23–26.

PLACES

Ancillary space

Ancillary space

Ancillary space

Ancillary space

Ancillary space

Ancillary space

Ancillary space

Ancillary space

Core space: description
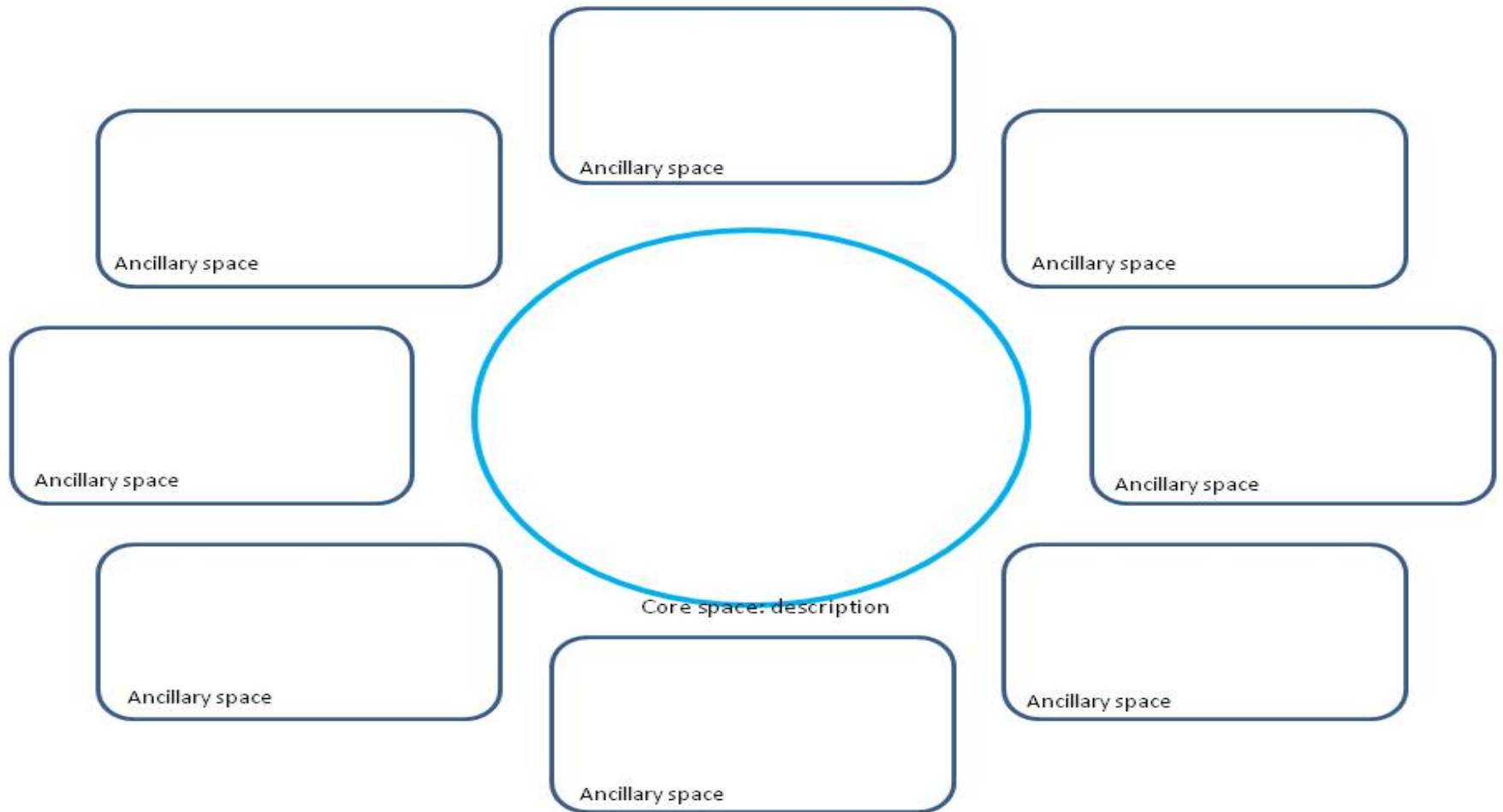
Describe the core space briefly
List the ancillary spaces (kitchen, canteen, photocopier, gym etc)
Describe the links between them and the core space (corridor, open walkway beside/through workstations etc)

	Description and comments	Linking spaces: description and comments
	E.g. Open-plan office 50-100 people, 10-50 people; floor of single offices etc	How each ancillary space is linked to the core space being evaluated: E.g. By corridors, open walkways, route through workstations, etc
Core space		
Ancillary space 1	E.g. Small meeting room(s) How many?	Linked to core space by:
Ancillary space 2	E.g. Large meeting or Board room(s) How many?	Linked to core space by:
Ancillary space 3	E.g. Informal meeting area. How many?	Linked to core space by:
Ancillary space 4	E.g. Office kitchen space(s), water coolers, coffee machines etc. How many?	Linked to core space by:
Ancillary space 5	E.g. Canteen/works cafe. How many?	Linked to core space by:
Ancillary space 6	E.g. Chill-out area(s). How many?	Linked to core space by:
Ancillary space 7	E.g. Privacy space/secluded small table etc. How many?	Linked to core space by:
Ancillary space 8	E.g. Communal area, foyer/reception, anywhere people congregate. How many?	Linked to core space by:

Figure 23: Places pages from V2.0 of the grammar of creative workplaces

PROPERTIES OF THE SPACE

In this space (when in use)...		0	1	2	3	4		Comments and descriptions
The smell is	Unpleasant						Fresh	
The atmosphere feels	Stuffy and airless						Fresh without being draughty	
The temperature for desk work is	Extreme (too hot/too cold)						Just right	
It feels lively	Not at all						Strong impression given of liveliness	
The sound levels are	Completely silent						Quiet buzz	
The environment is	Very messy						Orderly	
The sound levels are	Distractingly noisy						Quiet buzz	
People can walk about	Very short distances						Extensively	
People can chat	Not at all						Easily	
Quiet thought is possible	Not at all						Easily	

In this space...		0	1	2	3	4		Comments and descriptions
Team spaces contain team artefacts	Not at all						Almost all the teams	
Individual workstations are personalised	Not at all						Almost everyone	
The ceiling height is	Approx 10 ft or below						Above 10ft approx	
Workstation desks and chairs are	Extremely uncomfortable						Very comfortable	
Views of the outside are	None: no windows						Wide/far-reaching views	
Natural light is	Non-existent						Floods the space	
The sunlight glare is	Very strong						Non-existent	
The artificial light is	Glaring						Replicates daylight	
The colour scheme is	Monotonous (drab)						Cheerful	
The colour scheme is	Extremely bright						Calm	
Line-of-sight from workstations is	Less than 2 ft						Long (over 20ft approx)	

Figure 24: Properties pages from V2.0 of the grammar of creative workplaces

ACTIVITIES (creative behaviours)

In this space there are places where it is possible to...		0	1	2	3	4		Comments and description
Have formal/planned work conversations	Difficult						Very easy	E.g. Meeting rooms
Have informal/unscheduled work conversations	Impossible						Very easy	E.g. Chill-out areas, kitchen spaces, informal meeting spaces, corridors
See formal information	None						Plentiful	E.g. Posters, screens
See informal information	None						Plentiful	E.g. Post-it notes, team display boards, whiteboards
Experiment, play, try things out, craft, review	None						Plentiful	E.g Workshop areas, 'sandpits', football table play spaces
Bump into people by chance	Impossible						Highly likely	E.g. Coffee machine, water cooler, canteen etc
Encounter unexpected information and ideas	Impossible						Highly likely	E.g. Displays, journals, screens, bookshelves, etc
Encounter unexpected information and ideas from people from outside the site	Impossible						Highly likely	E.g. Seminars, visits, showing people around etc
Take short walks	Difficult						Many	E.g. To photocopier, kitchen, other offices etc

In this space there are places where it is possible to...			0	1	2	3	4		Comments and description
									E.g. Gym, jogging tracks, cycle paths
Exercise for long periods of time		None						Many	
									E.g. showers, bicycle racks
Have the facilities that support exercise		None						Many	
									For travelling to work e.g. bus, train, car parking
Have access to transport		Difficult						Easy	
									E.g. Privacy space/secluded small table etc (observed)
Think and reflect quietly on one's own		None						Many	
									E.g. Configuration of workstation (observed)
Work without interruption		None						Many	
									E.g. Configuration of workstation (observed)
Work on one's own		None						Many	

Figure 25: Activities (behaviours) pages from the grammar of creative workplaces

AFFORDANCES OF THE SPACE

In this place there are affordances to support..		0	1	2	3	4		Comments and description
Making thinking visible inside teams	None						Rich	E.g. Whiteboards, flipcharts, writing walls, post-it boards etc
Making thinking visible between teams	None						Rich	E.g. Multi-touch electronic tables, video-conferencing, whiteboards, flipcharts, writing walls, post-it boards, posters etc
Thinking visually together	None						Rich	E.g. Whiteboards, flipcharts, writing walls, post-it boards etc
Collaborating with others/other teams	None						Rich	E.g. Multi-touch electronic tables, video-conferencing, whiteboards, flipcharts, writing walls, post-it boards
Informal conversations	None						Rich	E.g. Coffee machine, water cooler, chill-out area etc
Productive thinking	None						Rich	E.g. Access to other people, information and ideas
Bumping into unexpected information and ideas	None						Rich	E.g. Seminars, visits, showing people around etc (observed)
Bumping into people unexpectedly	None						Rich	E.g. Coffee machine, water cooler, chill-out area etc (observed)
Experimenting, playing with ideas, trying things out, crafting, reviewing	None						Rich	E.g. Whiteboards, flipcharts, writing walls, post-it boards etc (observed)

In this place there are affordances to support...		0	1	2	3	4		Comments and description
								E.g. Walk to canteen, kitchen, photocopier, printer, other offices, workshop etc (observed)
Casual physical movement inside the building	None						Rich	
								E.g. Gym, jogging track etc
Intense physical activity	None						Rich	
								E.g. Easy access to car parking, bus, train
Mechanical movement	None						Rich	
								E.g. Chill-out space, sofa, easy chairs, secluded small table etc (observed)
Daydreaming and reflection	None						Rich	
								E.g. Unoccupied small office, screens, secluded small table/desk; chill-out area, table in canteen etc (observed)
Thinking and writing solo	None						Rich	
								E.g. Chill-out space, sofa, easy chairs, secluded small table etc (observed)
Generating ideas solo	None						Rich	
								E.g. Meeting room (large or small), dedicated thinking space, chill-out area etc (observed)
Generating ideas in a group	None						Rich	
Other comments:								

Figure 26: Affordances pages from V2.0 of the grammar of creative workplaces

6.2.1 The grammar of creative workplaces: Place

The first two pages of V2.0 comprise an inventory of places that were identified in the findings as supporting creativity in the workplace. There are two different layouts of the same information – words or shapes – permitting assessors to choose whichever layout they prefer. The grammar asks for a description of the core space being considered, and for an inventory of subsidiary or ancillary spaces that are linked to the core space. There are guiding prompts in the words page which originate in the research respondents' data (Table 15, page 110). These prompt the grammar's user to look for different types and sizes of offices, meeting rooms and communal areas, and for support areas such as kitchen and canteen areas and places for privacy and relaxation. The pages also contain prompts to observe and make notes about the linking spaces, such as corridors, walkways and stairs that connect the core with the ancillary spaces.

6.2.2 The grammar of creative workplaces: Properties

The properties of physical press supporting creativity in the workplace were found to be sensory (Chapter 5, Tables 17 & 18 pages 113-114). The grammar, therefore, evaluates the extent to which these supportive properties are present in the workplace. The findings grouped the properties into six categories: comfort, sight, sound, spaciousness, movement and aliveness. The grammar includes each of these (Figure 24), with their subcategories: comfort consists of smell, air quality, temperature and levels of comfortableness in chairs and other furniture; sight includes light (natural and artificial), views, and colour; sound assesses the level and quality of noise; spaciousness comprises line-of-sight and ceiling height, and includes messiness/orderliness; movement looks at the extent to which people can walk about the space; and aliveness contains the Steinerian senses of speech (conversation), thinking, life (liveliness) and the I (personalising individual and team spaces).

The grammar differentiates between evaluating spaces when they are in use, and when they are empty. This was in response to difficulties encountered by grammar assessors when workplaces were in use during the working day. The first page of the properties section looks at those properties that can only be assessed when the workplace is busy, and the second page looks at other properties that can be assessed when the workplace is both busy and empty.

The use of semantic differentiation (Mehrabian & Russell, 1974) as an evaluation tool is discussed in full in Section 6.4 (page 173) of this chapter.

6.2.3 *The grammar of creative workplaces: Creative behaviours (activities)*

The creative behaviours pages of the grammar (Figure 25) consider the syntactic elements of the grammar of creative workplaces. At the time of the testing these were called activities but the title was thereafter changed to behaviours to differentiate between those activities that could in and of themselves be said to be creative (writing, painting, problem-solving and so on) and those that facilitated creativity (engaging with people, information and ideas, and disengaging from them). Hence the double titling in the grammar pages. These are the behaviours that facilitate creativity, and round which the lexis (place, properties and affordances) is structured. The behaviours were identified by research respondents as facilitating their ability to be creative in work, and form the engage/disengage model of creative behaviours, set out in Table 22, page 126.

The creative behaviours pages enable the grammar user to observe whether the workplace supports its users' ability to: engage with other people in planned and chance conversations and meetings; engage with information and ideas formally and informally; disengage easily from others and environment for short or longer periods of time, and through physical or mechanical movement.

6.2.4 *The grammar of creative workplaces: Affordances*

Figure 26 (pages 149-150) of the grammar sets out the affordances (Gibson 1977) identified by research respondents as actively supporting their workplace creativity (Table 21, page 120). These affordances are the tools and equipment that support creative behaviours, for example whiteboards and writing walls to afford the possibility of collaborating visually, display board for making ideas and information visible to others, small secluded tables where private conversations can take place or people can work on their own uninterruptedly.

Figures 23, 24, 25 and 26 present V2.0 of the grammar of creative spaces as it was tested for accuracy in two UK studies. The following sections describe how V2.0 of the grammar was arrived at through the testing process.

6.3   Testing the grammar of creative workplaces

The emergent grammar described in Chapter 5 as developing from Stages 1 & 2 of the research (Figure 22, page 134) was composed of the three core findings of physical press (lexis), the engage/disengage model of creative behaviours (syntax) and the creative footprint (meaning).   In Stage 3 of the research process the strength of these three elements' interaction as an explicit grammar was tested, refined and verified.   The emergent grammar's content (lexis and syntax) was tested for completeness in a focus group.   Once refinements and modifications had been made to the content, the grammar's method (its design, evaluation type and ease of use) was tested through three prototype tests of version (V1.0) of the grammar.   In the process of doing so, the content was further refined, and the accuracy testing initiated.   After consequent modifications to the grammar's content and method two tests were conducted on the second version (V2.0) of the emergent grammar of creative workplaces in two organisations (Final Test 1 (FT1) and Final Test 2 (FT2).

This section, therefore, examines these three test stages in depth, setting out the findings of each and relating them to the final version (V2.0) presented earlier in Figures 23, 24, 25 and 26.

6.3.1   Testing the grammar's lexical components

The lexical and syntactic components of the grammar were tested in a focus group of post-graduate students and university faculty.   As described in Chapter 4, pages 82-84, the lexical components of the grammar of creative workplace that emerged from the data (place, properties and affordances) were individually printed on cards (Appendix 17) and made up into packs (103 cards in each, including two blank ones inviting additional elements).   These packs were distributed to the focus group members who then made diagrams of their creative processes (Appendix 15).   The range of focus group members' creative processes on the small-c to big-C continuum (Simonton 2005) was wide, as they were all artists as well as holding down more conventional jobs as faculty, administrators, teachers.   Each focus group member drew their creative process on large sheets of paper, and populated the diagram with the cards.   The aim was to see how many, and which, of the cards were used, and whether any more components were added.   Figure 11, page 83 shows one of the diagrams complete with cards, as does Figure 27 below.
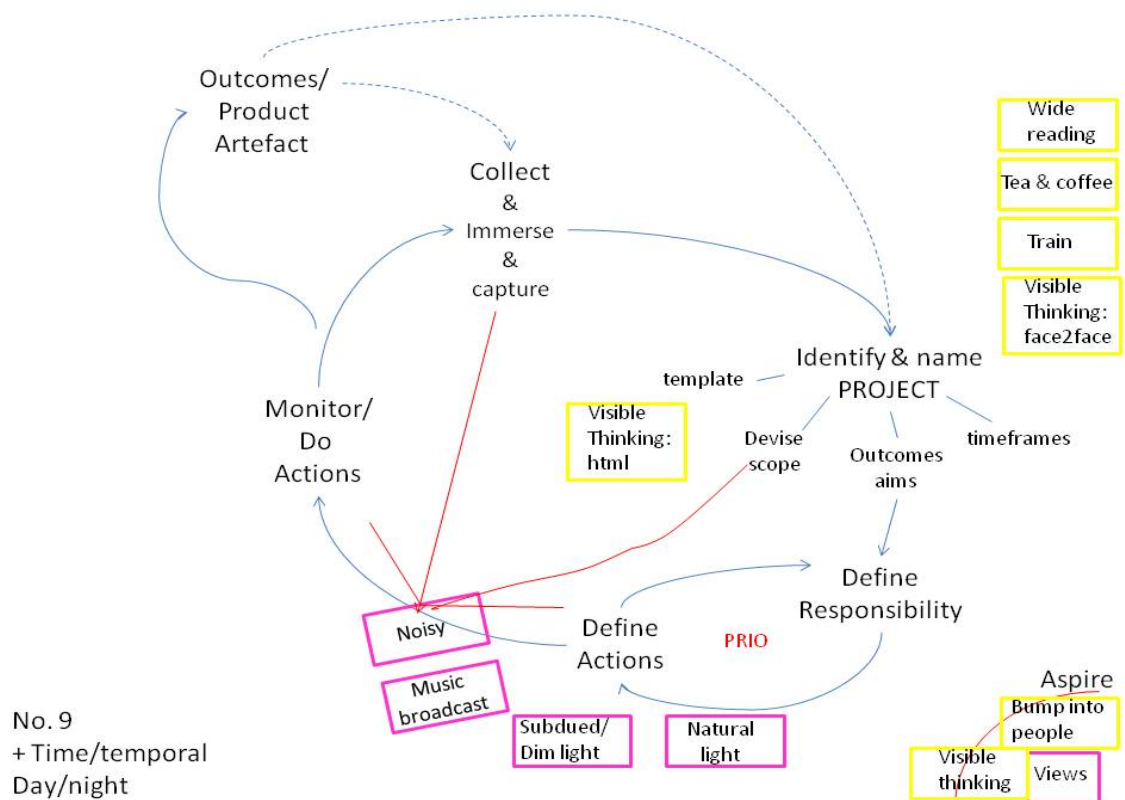
Figure 27: Creative process diagram made by Focus Group member 9

In this diagram (Figure 27) focus group member 9 placed properties cards (pink border) and affordance cards (yellow border), next to the creative process stage they supported. Thus, when defining his actions he likes to have noisy music playing, and different possibilities of light – both subdued and natural. When working to identify and name his project the focus group member needs to be able engage with ideas, information and people through reading widely, using the web, having face-to-face meetings and making his thinking visible to others. He also needs to disconnect from the issue briefly by taking a tea break, or for longer on a train journey. When 'aspiring', that is, generating ideas, he disengages by contemplating views; and engages through chance meetings with people and sharing ideas visually. In this drawing the element of time emerged as another part of the lexis: what might be a person's optimum creative time of day, linked to their circadian rhythms. Two other diagrams raised the issue of play, which was added to the syntax under the heading of crafting/experimentation/play.

Each of the 103 cards provided were used across the focus group. Table 27 (below) lists the most frequently used cards of each lexical component. The data reflect the focus group members' wide use of creativity across the small-c to big-C spectrum, and their relatively unstructured work patterns. In 'place' they talk more often of informal than of formal work environments: "Share my thinking with others in cafe/bar/over

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breakfast" and "I can think well when I'm on a train through countryside like between the Lake District and Glasgow".

Lexical component		Cards most frequently used in each lexical component	No of times used across focus group
Place: Outside	Every card used across focus group	Walking in the park	4
		Moving in the street	4
Place: Inside		Informal home office	4
		Cafe/restaurant	4
Properties	Every card used across focus group	Views	7
		Neutral or no smell	5
		Natural light	5
Affordances:	Every card used across focus group	Making thinking visible	5
		Discussion	4
(for engagement)		Face-to-face with others	4
		Engage with new ideas	6
		Engage with the unexpected	5
		Wide reading	5
(for disengagement)		Coffee breaks	8
		Train journeys	7
		Getting a drink of water	4

Table 27: Use of lexical component cards by focus group members

In properties, the most often mentioned elements were views, natural light and neutral smell, substantiating the Stage 1 data. The affordances most often mentioned were those that supported engagement: "Cafe – lots of people around" and "If I'm writing I have to be reading also". However, coffee breaks and train journeys for disengagement were more frequently reported than any other component in any category.

Because each component card was used by the focus group, in many cases several times it is possible to conclude that all the listed elements and sub-categories of physical press (place, properties and affordances) form a comprehensive lexis for the grammar of creative workplaces. A full analysis of the data is provided in Appendix 18.

6.3.2   Testing the grammar's method

In order to establish how best the grammar should be designed and used, a prototype grammar (V1.0) was written and tested in three workplaces. This version preceded the full V2.0 presented in Figures 23, 24, 25 and 26. Although V1.0 contained the same lexical elements as V2.0 (place, properties, behaviours and affordances), there were key differences between V1.0 and V2.0 in method: how the grammar was designed, used, and evaluated. Changes were made as a result of the finding that aspects of V1.0's

design made it difficult for the people using the grammar to do so objectively and accurately. These issues are explored in this section.

The prototype grammar's (V1.0) method was tested through three studies conducted in a US university's research environments[20]. The research was carried out according to the testing structure described earlier in this chapter and in detail in Chapter 4, Section 4.4, pages 82-87. First an assessment of each workplace was made by an independent assessor (IA) (a different assessor for each of the three studies) using V1.0 of the grammar; then semi-structured interviews with users of two of the three workplaces were conducted by the researcher. Finally the two data sets (grammar assessment and interviews) were compared and conclusions drawn. The assessor for the first test, a Reader in Creative Practice at a UK university, was selected to see whether the grammar could be used by someone without architectural training. The second assessor was a post-graduate architectural student, chosen to explore whether a subject expert would use the grammar differently. The researcher made the third assessment. This was not independent, but was done to ascertain the grammar's usability and any content gaps from a position of expertise. All interviewees were graduate students with one exception who was a final-year undergraduate.

Because the original data had been collected cross-sectorally, it was considered that the addition of a further sector (academia) and a cross-cultural element (UK/US) would test the grammar's method comprehensively. Within the terms of this study, the research environments were considered to be under- and post-graduate students' workplaces.

In order to test V1.0 of the grammar and its method across a range of workplace types, each research environment selected was situated in a different university department and building. The first test of the grammar's method was conducted in a Health Institute (HI), a 1980s modernist building. The workplace studied was a single room shared by seven graduate students. The HI research room was set out in cubicles, one for each of the seven post-graduate students (Figure 28). The cubicles had high sides and cupboards above the desk areas. The colour scheme was brown, ivory and beige, with white acoustic tiles on the ceiling and grey carpet.

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[20] The university studied is one of the US's leading science and technology research universities, with a 400 acre city centre campus and 20,000 undergraduate and graduate students. The research was carried out under the US University's Internal Review Board (IRB) protocol as well as the researcher's own UK University's Ethics Committee.

Figure 28: Cubicle in HI research room

The room was lit from the ceiling by florescent tubes with diffusers. There were no windows in the room, either to the rest of the building, or to the exterior.

The next test took place in one of the College of Architecture buildings (Figure 29).

Figure 29: Architectural studio

Designed in 1939 as an engineering institute it had a 50 foot high open plan space at its centre and smaller offices and meeting rooms around its periphery on two floors. The

building was renovated for the College of Architecture and opened in 2010, with the open-plan central space creating graduate and undergraduate studios. It is this studio space that was assessed. The architectural studio (AS) is set out with long rows of benches where each student has his or her own area. There is a mezzanine floor (The Hammock) suspended at the rear of the studio, reached by stairs from the main studio and by the balcony (seen above the whiteboard on the left of the Figure 29 photograph). There are high-level windows along two sides, and a tall glass screen on the back wall, letting in considerable quantities of natural light.

The last method test took place in a single learning room in the Biomedical Engineering Department (BME) in a building specifically designed for its laboratory spaces, and opened in the twenty-first century. The room is one of a suite of such rooms, specifically designed for problem-based learning.
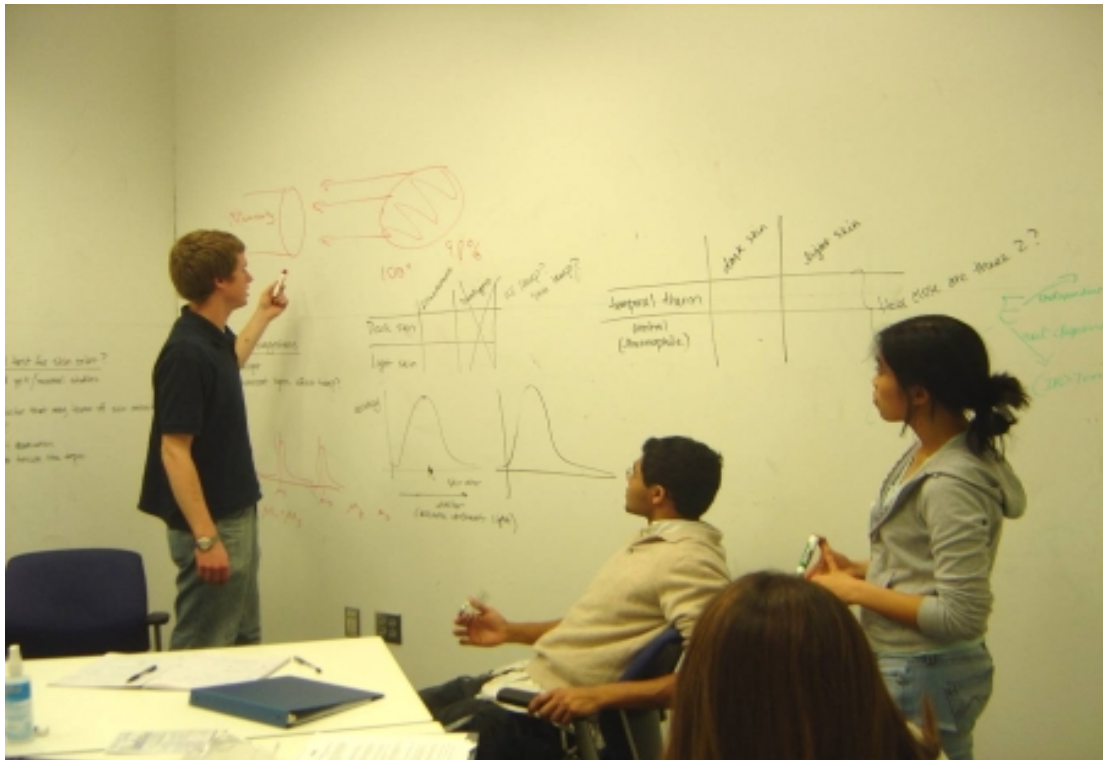
Figure 30: Problem-based learning room in BME building

The room is small (approximately fifteen feet by twenty) and is completely covered, floor to ceiling, in writable whiteboard. There are no windows. Unlike the windowless room in HI, it is only used in two-hour sessions, rather than the whole time.

These three research environments were assessed using V1.0 of the grammar (Figure 31 below).

Properties

	Description	Core	Ancillary	Area Number	Assessed quality 1-5 (5 high)	Impressions and comments
Taste & smell	Are you aware of any unpleasant smell?					
	Any pleasant smell?					
	How good is the food?					
Touch	How comfortable are the chairs? Desk height? Sofas? Other?					
	What kind of material is used for the furniture? Does it feel good?					
Temperature	Is there a good working temperature for a) sitting? b) moving around?					
Air quality	Fresh?					
	Stale?					
	Drafty?					
Sight	Views onto nature					
	Views onto buildings					
	Natural light (amount)					
	Colours - bright? Muted?					
	Red/yellow spectrum?					

		Core	Ancillary	Area #	Assessed quality 1-5 (5 high)	Impressions and comments
	Blue/green spectrum?					
	Degree of messiness/order					
Sound	Quiet buzz					
	Distractingly loud/noisy					
	Silence					
Spacious-ness	Long line-of-sight inside					
	Ceiling height - high/low					
Balance & acceleration	Non-linear spaces to move around in (eg curved corridors)					
Proprio-ception	Plenty of spaces for walking/ moving about inside the building					
Speech	Sense that people can speak freely with each other					
Thinking	Sense that the space encourages people to work on their own without interruption					
Life	Sense of liveliness in the space - laughter, smiles, enjoyment					
The I (ego)	individual and personal work spaces are personalised with displays, objects, plants etc					

Figure 31: Properties pages from V1.0 (prototype) of the grammar of creative workplaces

V1.0 of the grammar (Figure 31 above and in full in Appendix 19) was compiled in an Excel spreadsheet, printed and comb-bound. Each independent assessor (IA) was given a copy. As in V2.0 (in Figures 23, 24, 25 and 26) the grammar was set out with two pages for each of four areas: Place, Properties, Behaviours (Activities) and Affordances. Figure 31, showing V1.0's properties page, is included to demonstrate the differences between V1.0 and V2.0 (Figure 24) of the grammar.

Observation was used in the prototype (V1.0) grammar to assess the workplaces' components of place, creative behaviours and affordances. A Likert scale (1932) was used to assess the workplaces' properties. The independent assessors assessed their respective workplaces using a printed booklet of V1.0 of the grammar. The assessment aimed to address the following questions: a) whether the layout/design of the grammar made it simple to use, b) whether the test's administration permitted a robust assessment, and c) whether using a Likert (1932) scale in the properties section, and description only in the other sections, was appropriate for accurate evaluation. The overall aims were to identify any changes needed to content or method, and to start verifying the grammar's accuracy. Researcher reflections, noted throughout in the research journal and forming part of this exposition, iteratively influenced how each successive assessment was carried out. The learning from the first assessment (HI) was applied to the second (AS), and the learning from the second applied to the third (BME). In this way the process reflects the iteration of the earlier case studies.

The participating assessors and interviewees are given a code to ensure anonymity. The interviewees are all students of the university: two Prototype Test Interviewees in the HI (Health Institute) building (PTI/HI/1 and PTI/HI/2), and three Prototype Test Interviewees in the Architectural Studio (PTI/AS/1, PTI/AS/2 and PTI/AS/3).

6.3.2.1 *Testing the grammar's ease of use*
The first aspect of the grammar test discussed here is its assessment procedure – how simple was it to use the grammar.

The first test comprised an assessment by the UK independent assessor (PTIA/1) of the HI room (Figure 28, page 157) using the grammar, and two follow-up interviews with users of the space conducted by the researcher. The assessment was carried out when the space was occupied by three post-graduate students. The assessment took one hour, including walking round the 2nd floor of the HI building to note ancillary spaces. The researcher briefed PTIA/1 beforehand, and debriefed afterwards. PTIA/1 completed the

grammar fully, with only two omissions. In the 'Properties' section she did not put a score against the section of 'Taste & Smell' because there were no direct stimuli; and she ignored the columns asking for the core or ancillary position of the place, property, activity or affordance assessed. It had been agreed beforehand that the column asking for area numbers would be left out because the core space to be assessed was a single room. The 'Place' categories in 'informal spaces at work created/found by staff' were almost completely omitted, with only corridors and washrooms marked. This suggests a possible lack of clarity in the assessment objectives as relating to these spaces, and a need for more detailed briefing.

PTIA/1found the process stressful; notes from the research journal (RJ) demonstrate different aspects of this discomfort:

> *PTIA/1 finds it difficult to orientate herself in this building. Has to ask one of the grad students to help her. Is there also a question of lack of confidence? Needing an incumbent to negotiate the space?* (RJ 7th November 2011)

> *Later: Went around the space with PTIA/1 [a second time] and realised the extent to which her state of mind interfered with the assessment. Her visceral antipathy to the space [expressed in such terms as: "I can't bear this space"], and her unease at being a stranger in there, shut down her looking and she didn't see the only cubicle in which there were signs of life and imagination – where the place had been populated.* (RJ 7th November 2011)

> *Later: going round the next day with the video camera, I realised [...] that I too had missed a whole cubicle at the end which is just crammed with papers, notes, pictures, life – also partial viewing based on embarrassed restriction – not wanting to [intrude] into places that are semi-private.* (RJ 8th November 2011)

Figure 32 (below) shows the densely populated and personalised cubicle, in sharp contrast to the others in the room which are almost completely devoid of objects (Figure 28 above). Although in the corner furthest from the door, the cubicle was in plain sight, but the assessor's antipathy to the room, and the researcher's wish not to intrude on people's work prevented both of them from seeing it on the first visit to the room. It was only on a second visit to the room that the researcher noticed it.
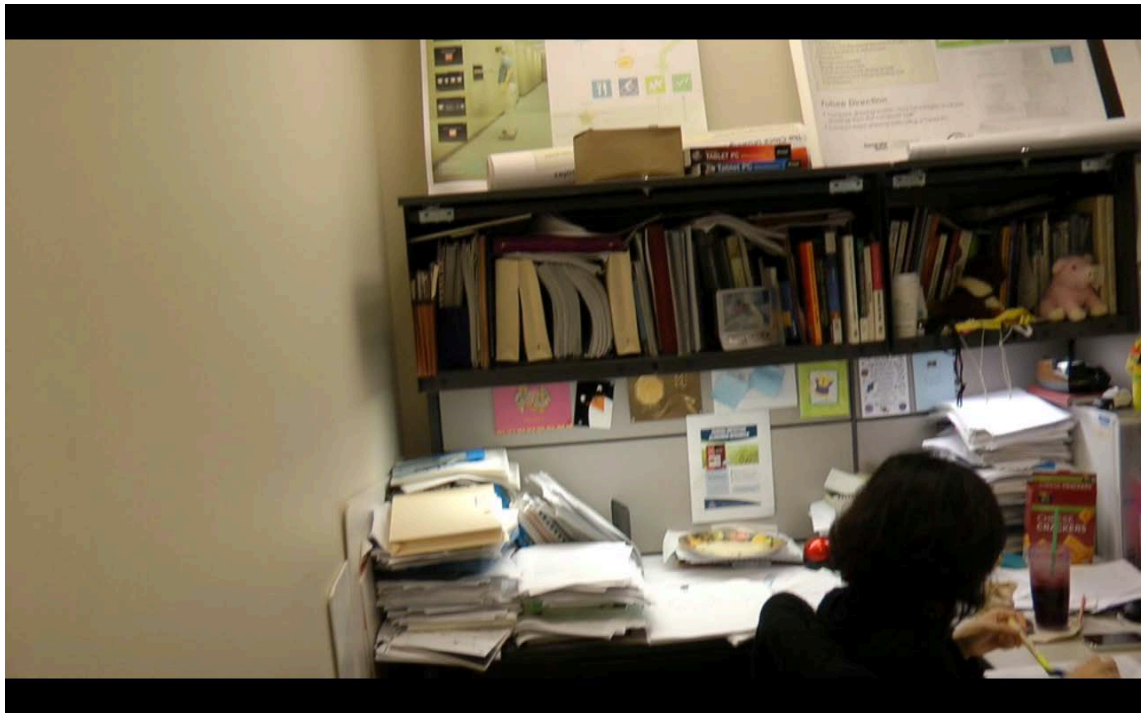
Figure 32: Densely populated cubicle in HI research room

The following points emerged from the assessment process: a) the design of the grammar should be clearer to ensure that every aspect is completed, b) the assessor needs more training than just a simple briefing, or should already have some relevant training (in, for example, architecture) so that they are more professionally attuned to what they are looking for, and c) the ideal time for an assessment to take place might be when the space is empty. Journal notes include:

Do I only use independent assessors who have some kind of architectural or interior [design] skill? Is this going to be a key thing to consider? (RJ 8th November 2011)

Do the assessors need a special training? (RJ 8th November 2011)

It is probable that the assessment should be done when space is empty. [PTIA/1]'s reflection, and me forgetting to video the space during the PBL class [see Test 3] point to this. Without people, then the videoing and the time to do it right and go back [over missed points] are not an issue. (RJ 8th November 2011)

The second test of the prototype grammar (PT2) was conducted in the main studio of the College of Architecture (AS) (Figure 29, page 157). In response to the reflection that it should be done by someone with architectural training, the assessment was conducted by a post-graduate architecture student.   Most of the assessment was done from a vantage point on a balcony overlooking the main studio.   The independent

assessor reported that this made the assessment simple to do, bearing out the observation that a minimum amount of involvement in the ongoing work of the workplace is desirable. As briefed, the assessor ensured that the core/ancillary columns were marked. In response to the difference observed in HI between the populated and unpopulated cubicles, an extra dimension of 'potential use of the spaces' was added (hand-marked by the researcher during the briefing) to supplement the sections on 'Behaviours' and 'Affordances'. This is especially clear in the contrast between Figures 28 and 32, the unpopulated and populated cubicles in HI.

As in Prototype Test 1, the 'place' categories in 'informal spaces at work created/found by staff' were again almost completely omitted. PT/IA/AS marked only 'corridors'. This emphasised the need for more clarity in the assessment design, and a possible need for more detailed briefing. PT/IA/2 found the process easier than did PT/IA/1. He was already familiar with the space, knew some of the people working in it, and worked from a detached vantage point, all of which helped remove any potential affective impact as had been experienced by PT/IA/1.

The third assessment was conducted in the problem-based learning room (Figure 30, page 158) by the researcher, while a session was in progress. The process was, as seen in the last research journal note above, compromised by the presence of people in the room. The session lasted one and a half hours, and was led by one of the BME Professors. The researcher was introduced to the class of eight students, and invited to contribute to the class's thinking as the session progressed. In the event the researcher made only two contributions, mindful of the possibility of skewing the data. The process of using the grammar was straightforward for the researcher, but being in the room when it was in full use compromised objectivity. Journal notes include:

> *Sat in on the PBL class [...] Also forgot to video it [...] interesting doing the grammar while the class is in progress.* (RJ 10th November 2011)

The researcher's experience reinforces the understanding that assessing a space when it is in use risks detracting from the aim of the assessment – to evaluate only the physical press.

6.3.2.2 *Testing the grammar's content*

The second aspect of the grammar examined here is its content. Aspects of the grammar's content raised questions: whether the grammar should differentiate between 'core' and 'ancillary' spaces, and between actual and potential use of affordances, as

demonstrated by the different way the cubicles in HI were used. This was followed up in PT2 with the assessor briefed to make a differentiation between the two. However, the differences in comments between actual and potential use were minimal: with the question "What affordances are there for travel?" the comment under potential use is "There is a parking lot just out of the building, but it is for faculty" and under actual use is "Some cars are parked there"; and with the question "What affordances are there for deliberately engaging with people?" the comment under potential use is "Walls that can pin posters [sic]" and under actual use is "Many posters are pinned on the walls". It was decided that as both the actual and potential use of an affordance is inherent within it (Gibson 1977) drawing a distinction between the two in the grammar did not add any extra or useful dimension. The distinction was therefore removed in V2.0.

Because in both PT1 and PT2 the assessors were focusing on the core studio space, the differentiation between core and ancillary spaces made little difference to the assessment.   However, they remained in V2.0 of the grammar, but were given a different layout that enabled a full inventory of workplace areas to be made (see Figure 23), both diagramatically and written.

In PT3 the researcher identified two property elements missing from the lexis: ambient sound and artificial lighting. These were both added to V2.0. No new lexis elements emerged in either PT1 or PT2.

6.3.2.3   *Testing the grammar's evaluation method*
The third aspect of the grammar discussed here is its evaluation method; that is, how the assessment of the workplaces was scored. Although the primary aim of V1.0 was to evaluate the grammar's method, a secondary aim was a preliminary exploration of the grammar's accuracy (done by comparing the workplace assessments of the grammar with those of the workplace's users). However, when the grammar assessment of the workplace was compared with the users' assessment (from the semi-structured interviews conducted by the researcher) the form of V1.0 made assessment problematical. There was no way of knowing how the grammar, as opposed to the independent assessor prompted by the grammar, assessed the workplace. The grammar pages of place, behaviours and affordances relied on the assessors making a full written report of their observations which could then be compared with user perceptions. Although both PT/IA/1 and PT/IA/2 made adequate notes, each was possibly biased in different ways: PT/IA/1 with her affective response to HI, and PT/IA/2 by his prior knowledge of AS.

Each element of properties was assessed against a Likert scale of $1 - 5$ (where 5 was high). However PT/IA/2 omitted the 1-5 Likert scoring in all but two places (scoring 4 for 'smell': "some coffee smell in the main studio" and 4 for 'temperature': "wearing short [sleeved] shirt is comfortable in the space").   Although PT/IA/1 scored each element (adding 0 where there was no information, for example against views because there were no windows), the scoring did not reflect the ability of each element to support or otherwise workplace users' creativity. For example, "Air quality: stale?" scored 4, when it is a contra-indication for creativity; and "Sound: distractingly loud/noisy" scored 5 with the comment "very quiet" added. The Likert scale layout was not consistent, resulting in unreliable data. Thus, because the grammar's method was unsound, its accuracy could not be assessed with any degree of certainty.

Testing the prototype grammar resulted in five key findings. These were, on the grammar's content:

1. A differentiation is needed between core and ancillary spaces
2. Two sensory properties to be added to the lexis: ambient sound, and the quality of any artificial lighting.

The findings on the grammar's method were:

3. Assessment may best be carried out when the building is empty, or the assessor should in some way be disengaged from the activities going on in the workplace when the assessment is carried out. This makes allowance for an assessor's possible affective involvement in the evaluation. Elements of sound and aliveness should be evaluated separately when the office is fully populated.
4. Examples should be added in each section of the grammar so as to enable the assessor, of whatever expertise or background, to understand what is needed at each stage of the assessment.
5. The Likert scale did not elicit the detailed data needed for a full space assessment or for an accurate evaluation, nor did it aid clarity. An alternative was sought, and it was decided that a semantic differential scale (Mehrabian & Russell 1974) would avoid ambiguities and provide a more objective and accurate evaluation.

In the light of these findings, alterations were made to V2.0 to aid clarity, simplicity of use and increased accuracy.   The next section (Section 6.3.3) compares the grammar's evaluation of the three test spaces against that of interviewed users of the spaces.

6.3.3 Testing V1.0 grammar's accuracy

This section examines the accuracy of V1.0 of the grammar through two environments: the Health Institute (HI) and the Architectural studio (AS). Both data sets are presented in summary.

The test of V1.0's accuracy was structured around the comparison of two data sets: that collected by the IAs using the grammar, and that collected in semi-structured interviews (Appendix 4) with users of the workplaces evaluated. The data were compared and scored qualitatively, as the sample set was small. The criteria for scoring the degree of correspondence between grammar and interviewee data are set out below in Table 28 (reproduced from Chapter 4, Table 10 page 87).

SCORE	Correspondence levels	Criteria for correspondence
5	Identical evaluation	Identical/very similar evaluation by the independent assessor (IA) and by all interviewees
4	Parallel evaluation	Parallel evaluation by the independent assessor with that made by all interviewees, but in different language or strongly inferred
3	Partially Identical	Identical or very similar evaluation by the independent assessor (IA) and by half of the interviewees
2	Partially Opposing	IA makes opposing evaluation from one or more interviewee
1	Completely Opposing	IA makes opposing evaluations from all interviewees (or from half of the interviewees, and the others make no mention of the point)
0	No correspondence	No mention made by interviewees of an evaluation point made by IA; or by IA of an evaluation point made by interviewees

Table 28: Correspondence criteria for grammar evaluation

The scoring goes from 0 where there is no correspondence between the grammar data and the data from the interviewees, through 1 where the grammar's and the interviewees' evaluation is in opposition, to a score of 2 where the opposition is partial, to 3 where there are similar evaluations made by the grammar and half of the interviewees, to 4 where the correspondence between grammar and interviewee data is strong but different language is used, or the correspondence is strongly inferred rather than being explicit. The highest score is 5, where the grammar's and interviewees' assessment of the workplace data is identical or very similar. Table 29 (below) contains worked examples taken from PT1 (HI).

	Criteria for correspondence	Example
5: Strong correspondence	Identical/very similar evaluation by the independent assessor (IA) and by all interviewees	IA: "No views" Interviewees 1 & 2: " Window would be nice; it is one of the important elements" " I would like to have windows so that the space can connect to the exterior"
4	Parallel evaluation by the independent assessor with that made by all interviewees, but in different language or strongly inferred	IA: The workstations could be private quiet places as they are individual cubicles – it is <u>very</u> quiet. [...] potentially good space for quiet reflection Interviewee 1: "[Getting an idea] happens when I am alone. So if I am immersed in my own thinking" Interviewee 2: "Sometimes you can focus on one thing for a long time if your mind will be restricted so you are [not] able to scan for all the possibilities and also the creativity path" "I feel like I am restricted to the cubicle"
3	Identical or very similar evaluation by the independent assessor (IA) and by half of the interviewees	IA: Chairs "comfortable but not too relaxing" Interviewee 1: "I quite like this chair [...] It is comfortable to sit for a long time."
2	IA makes opposing evaluation from one or more interviewee	IA: "Very quiet – intimidating – not conducive for chatter" Interviewee 1: "Easy to have a chat with my colleagues" Interviewee 2: "If I want to have discussion – if I want to have some talk with some people […] I feel like I am restricted to the cubicle."
1	IA makes opposing evaluations from both interviewees (or from one interviewee, and the other makes no mention of the point)	IA: "Very little personal possession of the space, few artefacts" Interviewee 1: "Sometimes [my colleague in populated cubicle] will use some cute notepad or a cute drawing" Interviewee 2: "People's working space – they like to make it work for them because information around them so that they can find it just by […] scanning"
0: No correspondence	No mention made by interviewees of an evaluation point made by IA; or by IA of an evaluation point made by interviewees	IA: "Average ceiling height" Interviewees: No mention

Table 29: Qualitative scoring the degree of correspondence between grammar and interviewee data

A score of 5 indicates high correspondence between what the grammar says about a workplace, and what its users say. For example, in Table 29 (above) the IA, using the grammar, notes that there are no views, the interviewees both report wanting windows. At the other end of the scale, a score of 1 indicates a low correspondence between the two data sets, with the IA using the grammar indicating "Very little personal possession of the space" whereas both interviewees report personalisation of the working spaces. This last point also reinforces the need for the grammar to be robust even when assessor affect is involved. This concern is addressed in V2.0 of the grammar.

When the scores in specific categories are collated, they fall into three groupings: high correspondence, medium correspondence and low correspondence. **High** is where the correspondence between the highest possible score and the actual score is 80% or above; **medium** is where the correspondence between the highest possible score and the actual score is between 60% and 79%; and a **low** correspondence is one where the correspondence between the highest possible score and the actual score is 59% or less.

6.3.3.1 *Summary of HI & AS assessments*

This section summarises the correspondence between the grammar assessment and interview data in the Health Institute and the Architectural Studio. The reader may want to refer to Appendices 20 and 21 for a full analysis of the correspondence between the grammar and interviewee data for both these sites. The analysis of the prototype grammar's data in both HI and AS was influenced by the issues identified with the grammar's method. Problems of IA bias and affective involvement in the HI assessment ("I can't bear this space"), coupled with lack of clarity in the grammar's design and evaluation methods (HI and AS), made it difficult to compare the grammar evaluation with the users' evaluation with any degree of accuracy.

The issue of IA (HI) bias and affect was examined through the second prototype test (AS). The selected AS assessor was familiar with the workplace and conducted the majority of the study from a vantage point on a balcony, rather than from inside the studio itself. These two changes from PT1 method aimed to address the issue of the IA being affectively involved with the people in the workplace being assessed. In the event, this appeared to make little difference. Table 30 below sets out the overall accuracy score for HI, and Table 31 below sets out the overall accuracy score for AS.

Grammar element (HI)	Overall correspondence score	Highest possible correspondence	Accuracy %	Accuracy level
Properties	38	80	47%	LOW
Behaviours	29	35	83%	HIGH
Affordances	30	50	60%	MEDIUM
TOTAL	**97**	**165**	**58%**	**LOW**

Table 30: HI workplace: correspondence between grammar and interviewee data

There was overall low correspondence between how the HI workplace was perceived by the grammar, as administered by the UK Reader in Creativity Studies, and by the users. In the Behaviours section the correspondence was high, due to the weighting of the grammar towards the exercise of concentrated, individual working: a behaviour which its users agreed HI supported well.

The accuracy score for AS has an overall medium (albeit at the low end of medium) correspondence between how the workplace was perceived by the grammar, administered by the architectural post-graduate student, and by the users.

Grammar element (AS)	Overall correspondence score	Highest possible correspondence	Accuracy %	Accuracy level
Properties	41	80	51%	LOW
Behaviours	18	35	51%	LOW
Affordances	41	50	83%	HIGH
TOTAL	**102**	**165**	**62%**	**MEDIUM**

Table 31: AS workplace: correspondence between grammar and interviewee data

The high correspondence on Affordances may be attributable to the IA's familiarity with the affordances present in AS, and to the interviewees' emphasis on crafting architectural models and diagrams. In AS there was a slightly higher correspondence on Properties than in HI. The creativity-supporting properties of the AS were very clear: the natural light, views, long line-of-sight, and colour, among others, were a matter of remark and of pride to the users.

The interviews were semi-structured rather than structured (with all the grammar's points dealt with in turn) to avoid as far as possible, leading the interviewees. This concern had been raised in CS3 when grammar elements were dealt with point by point in the surveys (see Appendix 6). Respondents agreed with each grammar element, suggesting that the questions were leading the answers.

The overall correspondence levels shifted only four percentage points between the HI and the AS assessments, indicating that either the grammar was inherently inaccurate, or the design and evaluation method were the predominant issues.

The recommendations taken forward for the next version (V2.0) of the grammar were therefore:

1. Use throughout of a semantic differential scale to enable consistent evaluation across all the grammar's areas, and comparison of one space with another
2. Prompts to be included in the grammar to ensure full range of possibilities presented, independent of assessors' knowledge
3. Independent assessors to be trained architects or space designers
4. Qualitative correspondence criteria to be adopted throughout

These changes were made to the grammar, and the content reordered to make a clear distinction between those aspects of the workplace that could be assessed at any time, and those that were to be assessed during the working day when the workplace was being used. The resultant V2.0 grammar is that presented at the start of this chapter in Figures 23, 24, 25 and 26, pages 143-150.

6.4   Test Phase 2: Version 2 (V2.0) Grammar Tests

The final testing of the revised grammar – Version 2.0 (V2.0) – was conducted in two large open-plan offices in two different business sectors. Final Test 1 (FT1) was conducted in the Scottish branch of a multinational engineering company, in the main office adjacent to a manufacturing plant. The building belongs to the company and they have been in it since the 1980s.   Final Test 2 (FT2) was conducted in the main office of a London Financial sector organisation housed in a new-build flagship City building (leased out by floors over a shopping mall).

As a result of the findings from the Prototype Test, changes were made to the grammar: its evaluation method, the process of carrying it out, and the content. The grammar's evaluation method was altered so that the properties, behaviours and affordances sections were each evaluated by the independent assessor using a semantic differential scale (Mehrabian & Russell 1974) of 0 – 4 where 4 is high. Both assessments were made by qualified architects, and were carried out in the late afternoon when the offices were almost empty. This aimed to address the concerns raised by the Prototype Test about objectivity.
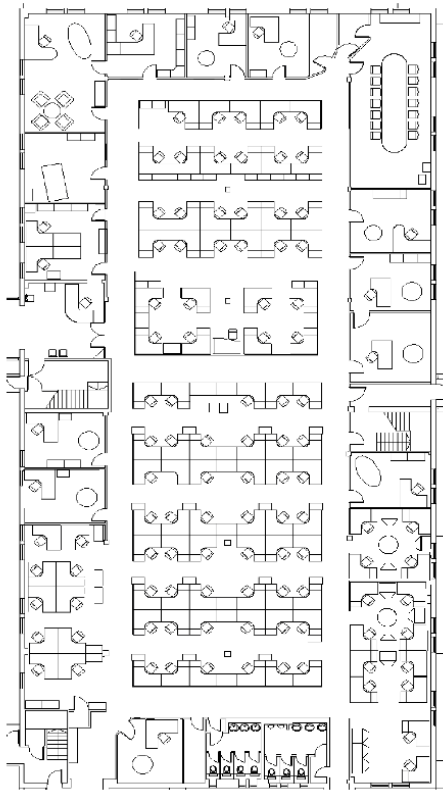
Figure 33: Open plan office of multinational engineering company (Scottish plant) Final Test 1

Figure 34: Open plan office of Financial Services company (Final Test 2)

The interviews were done earlier in the afternoon of the same day by the researcher, who also made notes of those aspects of the workplace that needed to be done when the offices were full, for example the properties of sound and aliveness. The grammar content was changed by adding the element of artificial light. FT1 was aided by a floor plan, and FT2 was done by the assessor directly to his i-Pad.

For test purposes, each section (properties, behaviours and affordances) of Version 2.0 of the grammar was designed using a semantic differential scale (Mehrabian & Russell 1974). The semantic differential scale differentiates between the extremes of each part of the lexis. In the section on properties (Figure 24 pages 143-144) for example, colour ranges from 'monotonous' to 'cheerful', or from 'extremely bright' to 'calm'; natural light ranges from 'non-existent' to 'flooding the space', and the sun's glare from 'very strong' to 'non-existent'. In the section on behaviours (Figure 25 pages 145-146) the range captures the ease or difficulty of behaving in specific ways. For example, 'having informal or unscheduled work conversations' ranges from 'impossible' to 'very easy', and 'taking short walks' ranges from 'difficult' to 'many'. In the section on affordances (Figure 26 pages 147-148) the range for each affordance is from 'none' to 'rich', that is, the environment either has none of the affordances that support a particular behaviour, has some of the necessary affordances, or is rich in such affordances. In the space left for comments and description there is a prompt list of the relevant kinds of affordances; for example, under 'thinking visually together' the prompts are: 'e.g. whiteboards, flipcharts, writing walls, post-it boards etc'.

The semantic differential scale and the prompts were significant in conducting the final tests in the two test organisations. Both independent assessors reported the ease with which they were able to complete the assessment. Each assessor took up to twice the time to make their assessments than that taken by the independent assessors in the Prototype Tests, reflected in the considerable detail they each observed and noted. Figure 35, below, shows the degree of FT1/IA's (Final Test 1, independent assessor) detailed observations on the second page of the Properties sheet. She used the 'comments and description' section to add detail to the scoring on the semantic differential scale.

In this space...		0	1	2	3	4		Comments and descriptions
Team spaces contain team artefacts	Not at all		X				Amost all the teams	Team in bottom LH corner have their 2 large boards - apart from this hard to tell teams (for me)
Individual workstations are personalised	Not at all				X		Almost everyone	Some more than others and generally tidy in any case and a lot have name boards up.
The ceiling height is	Approx 10 ft or below		X				Above 10ft approx	2.4 m standard for a domestic room! (not big long space?)
Workstation desks and chairs are	Extremely uncomfortable				X		Very comfortable	V. modern, clean, nice round corner, nice new char, double screens for most!
Views of the outside are	None: no windows	X					Wide/far-reaching views	Only people in bottom 2 corner spaces have windows. (and few some can see through?) would be good to start smoking?!
Natural light is	Non-existent		X				Floods the space	Virtually non existent apart from areas mentioned above at least canteen has daylight.
The sunlight glare is	Very strong					X	Non-existent	(I imagine) They have blinds day on all the windows to control this.
The artificial light is	Glaring			X			Replicates daylight	adequate. Typical office lighting done by calculation! Lighting to central pillars softens this but is overwhelmed by office lighting.
The colour scheme is	Monotonous (drab)				X		Cheerful	Warm cream and updated so cheerful + canteen space / BE space colourful
The colour scheme is	Extremely bright				X		Calm	Blues and greens, calm!
Line-of-sight from workstations is	Less than 2 ft				X		Long (over 20ft approx)	Good line of sight across room makes it seem sociable P want it to be

Figure 35: Final Test 1 completed Properties second page

The assessor's comments (Figure 35 above) on the lack of views and the lack of natural light: "Only people in bottom 2 corner spaces have windows (and then some can see through?). Would be good to start smoking!?" and "[Natural light] virtually non-existent apart from areas mentioned above. At least the canteen has light" correspond closely with workplace users' perceptions: "I [would] like more sunlight coming in. Where we are now the sun will come in for about 5 minutes and then it will go." The correspondence between the grammar's assessment of the workplace and users' assessment of it is examined in Section 6.4.1 below.

The extent to which the users of the space agree with the grammar's assessment of that space is examined. This is done according to the qualitative correspondence criteria in Table 28, page 167. These criteria are scaled from 0 to 5 where 0 indicates no correspondence and 5 indicates a high correspondence between what the grammar says about the workplace, and what its users say about it. Each aspect of the grammar is examined in turn in, firstly in FT1, then in FT2. The workplace properties are examined first, then the behaviours supported in the workplace, and lastly the workplaces' affordances.

The reader is referred to Appendices 22 and 23 for the full analysis of each test.

6.4.1   Final Test 1: Overall correspondence between grammar and interviewee data

In FT1's properties that enhance workplace creativity there is a low correspondence in 'comfort' where out of its four aspects of smell/taste, furniture comfort, air quality and temperature, only furniture is reported on by the workplace users.

Properties	Overall score	Highest possible correspondence	Accuracy %	Accuracy level
Comfort	4	20	20%	Low
Sight	29	30	96%	High
Sound	3	5	60%	Medium
Spaciousness	8	10	80%	High
Movement	4	5	80%	High
Aliveness	24	25	96%	High
TOTALS	**72**	**95**	**76%**	**MEDIUM**

Table 32   Properties: overall correspondence between grammar and interviewee data (FT1)

It is suggested that staff in the company take for granted the background properties of their workplace, only noticing them when they are either very good (as in the case of the

chairs) or very poor (as in the case of the lack of natural light). There is a medium correspondence between the IA's evaluation of the sound levels at 'quiet buzz' and that of the users who reported a variety of sound levels dependent on the time of day. This variation points to the need for subsequent applications of the grammar to take place both when the workplace is empty (as it was in this assessment) and when it is busy. In all other senses the correspondences are high, indicating a robust grammar reading of the workplace's properties, with the provisos noted about 'comfort' and 'sound'.

There is a high correspondence between grammar and interview data in the creativity-facilitating behaviours supported by FT1's workplace (Table 33).

Behaviours	Overall score	Highest possible correspondence	Accuracy %	Accuracy level
Engage deliberately				
• Formally with others	5	5	100%	High
• Informally with people	5	5	100%	High
• Formally with information	4	5	80%	High
• Informally with information	4	5	80%	High
Engage by chance				
• Experiment, play, try things out, craft, review	5	5	100%	High
• With people	4	5	80%	High
• With ideas & information unexpectedly and from outside the site	5	5	100%	High
Disengage				
• By physical movement (short walks)	5	5	100%	High
• By physical movement (longer periods of time) x2	5	5	100%	High
• Mechanical movement	5	5	100%	High
• Daydream & reflection (+ work on own)	0	5	0%	Low
• Think, write, generate ideas (+ no interruptions)	4	5	80%	High
TOTALS	**51**	**60**	**85%**	**HIGH**

Table 33: Behaviours: overall correspondence between grammar and interviewee data (FT1)

Only in the area of 'daydream and reflect' is there no correspondence. The assessor, prompted by the grammar, commented on this aspect but none of the interviewees mentioned disengagement for day-dreaming and reflection as part of their workplace behaviour. This raises the question as to whether these are in fact legitimate activities recognised by the organisation. The overall total of the correspondence is high, at 85%.

In the assessment of affordances, the issue of 'daydreaming and reflection' is again raised, with a zero score once more. The other low scoring area was staff collaboration, where IA was "not sure".

Affordances	Overall score	Highest possible correspondence	Accuracy %	Accuracy level
Making thinking visible				
• Inside teams	4	5	80%	High
• Between teams	4	5	80%	High
• Thinking visually together	5	5	100%	High
Working together				
• Collaborating	2	5	40%	Low
• Informal conversations	3	5	60%	Medium
• Productive thinking	5	5	100%	High
Serendipity				
• Bumping into unexpected information and ideas	4	5	80%	High
• Bumping into people unexpectedly	5	5	100%	High
• Experiment, play, try things out, crafting, reviewing	4	5	80%	High
• Generating ideas in a group	4	5	80%	High
Disengage by movement				
• Casual physical movement inside the building	5	5	100%	High
• Intense physical activity	5	5	100%	High
• Mechanical movement	5	5	100%	High
Disengage from others				
• Daydreaming and reflection	0	5	0%	Low
• Thinking and writing solo	3	5	60%	Medium
• Making ideas visible	4	5	80%	High
TOTALS	**62**	**80**	**77%**	**MEDIUM**

Table 34   Affordances: overall correspondence between grammar and interviewee data (FT1)

Other areas of medium correspondence are affordances for informal conversations and for thinking and writing solo. While the IA observed few areas for informal conversations, the workplace users were aware of more. The opposite was true of affordances for solo working; while the IA observed possibly unoccupied offices, the staff were aware of the restrictions on their use.

The overall scoring of grammar accuracy in FT1 brings together the elements discussed above of properties, behaviours and affordances in Table 35 below.

Grammar element (HI)	Overall correspondence score	Highest possible correspondence	Accuracy %	Accuracy level
Properties	72	95	76%	MEDIUM
Behaviours	51	60	85%	HIGH
Affordances	61	80	77%	MEDIUM
TOTAL	184	235	78%	MEDIUM

Table 35: FT1 workplace: correspondence between grammar and interviewee data

The scores point to the overall accuracy of the grammar when assessing the workplace's support for creativity, but one that is compromised by the lack of interviewees' awareness of their workplace's properties, and by being assessed when the workplace was nearly empty. Assessing the workplace when it is in use would permit more accurate observations to be made. The overall scoring of 78% is at the high end of the medium bracket, only two percentage points below high.

6.4.2 Final Test 2: Overall correspondence between grammar and interviewee data

Final Test 2 (FT2) was carried out in a Financial Services organisation in the City of London. The reader may wish to refer to Appendix 23 for a full data analysis.

Properties	Overall score	Highest possible correspondence	Accuracy %	Accuracy level
Comfort	13	20	65%	Medium
Sight	25	30	83%	High
Sound	4	5	80%	High
Spaciousness	10	10	100%	High
Movement	5	5	100%	High
Aliveness	23	25	92%	High
TOTALS	80	95	84%	HIGH

Table 36: Properties: overall correspondence between grammar and interviewee data (FT2)

In 'properties that enhance workplace creativity' (Table 36) the overall correspondence between grammar and interview data was high. The only section that fell below a high

correspondence was 'comfort', and it is suggested that this happened for the same reasons as in FT1: that users take the comfort factors for granted, again with the exception of comfortable furniture. Only one interviewee mentioned temperature, and that was because she had had cause to complain about it being too low for her. The IA judged the temperature as too high, but conducted the assessment wearing a heavy sweater which may have influenced his judgement. There is also a discrepancy between users' and assessor's evaluation of *aliveness* where the users felt the space to be very alive, but the assessor did not: "Area did not feel too lively, even though it was open space." However, the office was almost empty during the assessment.

Behaviours	Overall score	Highest possible correspondence	Accuracy %	Accuracy level
Engage deliberately				
• Formally with others	5	5	100%	High
• Informally with people	5	5	100%	High
• Formally with information	3	5	60%	Medium
• Informally with information	5	5	100%	High
Engage by chance				
• Experiment, play, try things out, craft, review	4	5	80%	High
• With people	5	5	100%	High
• With ideas & information unexpectedly and from outside the site	4	5	80%	High
Disengage				
• By physical movement (short walks)	5	5	100%	High
• By physical movement (longer periods of time) x2	5	5	100%	High
• Mechanical movement	3	5	60%	Medium
• Daydream & reflection (+ work on own)	5	5	100%	High
• Think, write, generate ideas (+ no interruptions)	5	5	100%	High
TOTALS	**54**	**60**	**90%**	**HIGH**

Table 37 Behaviours: overall correspondence between grammar and interviewee data (FT2)

The behaviours section of the FT2 assessment has a high correspondence between grammar and interviewee data. The two sections where the correspondence is medium rather than high are where the IA and the users noted different aspects of the workplace, all of which were present and supportive of their creativity.

Affordances	Overall score	Highest possible correspondence	Accuracy %	Accuracy level
Making thinking visible				
• Inside teams	5	5	100%	High
• Between teams	5	5	100%	High
• Thinking visually together	5	5	100%	High
Working together				
• Collaborating	5	5	100%	High
• Informal conversations	4	5	80%	High
• Productive thinking	4	5	80%	High
Serendipity				
• Bumping into unexpected information and ideas	5	5	100%	High
• Bumping into people unexpectedly	5	5	100%	High
• Experimenting, playing, trying things out, crafting, reviewing	4	5	80%	High
• Generating ideas in a group	5	5	100%	High
Disengage by movement				
• Casual physical movement inside the building	5	5	100%	High
• Intense physical activity	5	5	100%	High
• Mechanical movement	0	5	0%	Low
Disengage from others				
• Daydreaming and reflection	5	5	100%	High
• Thinking and writing solo	5	5	100%	High
• Making ideas visible	5	5	100%	High
TOTALS	**72**	**80**	**90%**	**HIGH**

Table 38: Affordances: overall correspondence between grammar and interviewee data (FT2)

The final section on affordances (Table 38) also demonstrates the high data correspondence. One section, mechanical movement, had a low correlation, as the interviewees made no mention of it. The assessor also chose to note a different aspect – motability – rather than the use of mechanical movement such as train and car journeys to stimulate creativity. The relevance of mechanical movement is one that appears to vary dependent on the organisation studied, and its geographical location. While it was an integral part of the creative processes of Stage 1 interviewees and of some of the Case Study respondents, it has not been a key behaviour or affordance in the test studies. This area may repay further study at a later date.

The overall scoring of grammar accuracy in FT2 summarises in Table 39 below the elements of properties, behaviours and affordances set out above..

Grammar element (HI)	Overall correspondence score	Highest possible correspondence	Accuracy %	Accuracy level
Properties	80	95	84%	High
Behaviours	54	60	90%	High
Affordances	72	80	90%	High
TOTAL	**206**	**235**	**87%**	**HIGH**

Table 39: FT2 workplace: correspondence between grammar and interviewee data

There were high correspondences between the grammar and the interview data in all three sections of the grammar in FT2. As with FT1 the lowest section is properties, both impacted by the users' disregard for anything that does not noticeably impact their working conditions. The sensory properties of the workplace could be posited to be hygiene factors (Herzberg 1959, 1987) and as such not noticed by the users unless they impact negatively.

The overall correspondence between grammar and interviewee data in FT2 is high, indicating a high level of accuracy of the grammar. The data analysis up to now has been assessing the accuracy of the grammar by comparing the correspondence between grammar and interviewee data. The following section analyses the grammar's assessment of the workplaces studied, and evaluates the workplaces for their capacity to support the creativity of their users.

6.5 Evaluating the test workplaces for their capacity to support user creativity

The use of a semantic differential scale made it possible to assess workplaces for their ability to support (or hinder) users' creativity and to consistently compare one

workplace against another. The scores are made up of the assessment given by the IAs on the semantic differential scale, that is, a score between 0-4, where 4 is high. The reader may wish to refer to Figures 23-26, pages 143-150 where V2.0 of the grammar is presented. The six main properties categories have 21 separate aspects, making a highest possible score of 84. The engage/disengage categories of behaviour have 15 separate behaviours aspects, giving a highest possible score of 60; and affordances have 16 separate categories, giving a highest possible score of 64.

The grammar evaluations made by the two independent assessors, scoring against the semantic differential scale of 0 – 4 (where 4 is high), found that the grammar assessed the physical workplace of the Financial Services (Final Test 2) organisation as more supportive of users' creativity than that of the Multinational Engineering (Final Test 1) company. The scoring is as follows:

Elements supporting user creativity	Highest possible score for support of workplace creativity		Final Test 1 score Multinational Engineering Co.	Final Test 2 score Financial Services Organisation
Properties	84	100%	47 (56%) Low	64 (76%) Medium
Behaviours	60	100%	36 (60%) Medium	41 (68%) Medium
Affordances	64	100%	37 (58%) Low	56 (87%) High
Overall totals	208	100%	120 (57%) LOW	161 (77%) MEDIUM

Table 40: Comparison of Final Test organisation scores on support for workplace creativity

When the scores of the two organisations studied are compared (Table 40 above), the scores on behaviours are similar, reflecting, it is suggested, the standard range of behaviours that can be expected in a commercial organisation in the course of normal working practice. That FT1's score is slightly lower may be a reflection of more controlled access to meeting rooms and a lack of informal meeting spaces. This can result in less ad hoc meetings taking place in FT1 than in FT2 where there are many small meeting rooms that do not have to be booked.

The main areas of difference are in the properties and affordances sections. The Financial Services (FT2) office's properties were excellent: floor-to-ceiling windows flooded the space with natural light and gave far-reaching views to the exterior. The colour scheme was imaginative and lively without being over-bright. The ceiling height was generous for the length of the space, and the internal line-of-sight was extensive. Other properties, such as aliveness and a sense of the I (personalisation of workplaces) were less pronounced, lowering the score. This last was attributed by one interviewee

as being a result of the large number of contract rather than permanent staff: "Most of us are freelance, and I think freelancers don't tend to [personalise our workspace]. We identify with the project and the team that we've be brought in to do, but we don't identify so much with the organisation. I think you'll see that – if you went to one of the offices in Dorking there is quite a lot of personalisation goes on, photos and the like, [...] because they are employed." The affordances of the office had been given considerable thought by its designers, with the space rich in meeting rooms and attractors (particularly a kitchen/photocopier/printer room where people reported chance and useful conversations). On the other hand, the Engineering (FT1) office had poor properties, with little direct natural light (what little there was, was filtered through the glass doors of those offices with external windows) and an inappropriately low ceiling. The independent assessor specifically commented that the ceiling's 2.4 metres height was appropriate for a domestic room, but not for a large working space. Aliveness was marked high as the assessor commented:

> There is a good vibe. It seems like a productive and quite a happy place unlike a lot of these places which can be depressing. It seems like the management have made an effort to make the best of the space they have got. The space itself could offer more.

FT1's affordances were also poor, with little opportunity for making ideas visible or sharing ideas and information visually across or within teams, with the exception of one team who had colonised their corner walls. The lack of walls in the rest of the space (the centre of the open plan office where the individual desks are situated) made for considerable restriction on displaying individual and team information. Interviewees reported, however, the benefits of being able to see other members of the staff: "You see people and [...] maybe they remind me to go and see another person. So yes, it helps me. [...] If I see someone it triggers that I need to go and speak to that person, or a person from that department".

The grammar of creative workplaces assessed the physical environment of the multinational engineering company's office (FT1) as supporting its users' creativity at 57% of full support (120 points out of a possible 208). The office of the financial services organisation (FT2), on the other hand, is assessed as supporting workplace users' creativity to 77% of full support (161 points out of the possible 208). The grammar, used in this way, points up the aspects of the workplace that are actively supporting small-c creativity in staff, and where they are hindering it.

6.6 Conclusions

Different aspects of the grammar have been examined through the research test period. Its form and layout, implementation, evaluation scoring mechanisms, correspondence criteria and its content have all undergone iterative change. The successive forms of Version 1.0 have seen the emphasis of *place* altered to include core and ancillary spaces; the implementation changed from non-specialist to specialist assessor and the assessment carried out from a non-engaged viewpoint; and missing content (artificial light, ambient noise) identified. The understanding that V1.0's evaluation method (a Likert scale) was unworkable led to the search for a viable alternative.

The second version of the grammar implemented all of these changes: *place* is now both a diagram and a list in the front section of the grammar, differentiating between the core space being assessed, and the ancillary spaces supporting it. Both FT1 and FT2 assessments were carried out by practicing professional architects, and both took place when the workplace was minimally populated at the end of the working day. This last led to a skewing of the assessment in FT2 where *aliveness* was assessed less high than if the space had been populated, and be revisited in future studies. It may be necessary to assess a workplace when people are working there as well as when they are not. In both cases the researcher made notes to complete any sections (especially ambient noise) that the assessors were unable to mark. The independent assessors both reported that V2.0 of the grammar was self-explanatory and simple to use. Although the researcher was present throughout each assessment, transcribing interviews in a side room, neither assessor asked clarification questions.

Finally the evaluation method was changed from a Likert scale (1932) to a semantic differential scale (Mehrabian & Russell 1974) throughout the sections on properties, activities and affordances. This delivers two key outcomes. The first is a clear indication against which the correspondence with the users' perception of their workplace can be measured. This outcome is relevant for the purposes of this thesis only, permitting the grammar's accuracy and robustness to be assessed. In both FT1 and FT2 the correspondences are high (and FT2's *medium* against properties (*aliveness*) is explainable against the time of day the workplace was assessed) suggesting that the grammar is indeed robust and accurate.

The second outcome is a grammar scoring on the extent to which the workplace is measured as supporting user creativity. This outcome is important as it forms the basis

for the development of the grammar beyond this study, and the collection of data in a longitudinal post-doctoral study. Chapter 8 explores this in greater detail.

It is therefore asserted that the form and content of V2.0 of the grammar of creative workplaces is robust. It is further suggested that its implementation, with the addition of an assessment process that permits a workplace evaluation when people are in the office as well as when it is empty, is also robust. The contents (place, properties, activities and affordances) have been showed to be complete in that neither assessor added any further observations. The method of V2.0 of the grammar can be said to have improved significantly from its prototype form. Issues of confusion over the scoring were resolved by replacing the Likert scale with the semantic differential scale. Issues of lack of assessor knowledge were resolved by the addition of prompts. These did not limit the assessors, who observed and noted more detail than the prompts contained. The question was raised as to whether the revised form of the grammar would lend itself to use by a lay person, and will be pursued in post-doctoral research.

6.6.1 Development of the grammar of creative workplaces

The grammar's form at the completion of the test phase is that of a construction grammar. The final form of the grammar as described next in Chapter 7 is a generative one (while still maintaining its syntax-semantic basis). The development of the grammar from one type to the other is, it is argued in that chapter, a necessary adjunct of the syntactic form.

The grammar's syntax lies in the interaction between the elements of the engage/disengage model of creative behaviours. In analysing these elements and their interaction with each other and with the lexis, it became clear that a generative component was called forward. Constructivist grounded theory's constant comparator method allows for the continuous categorisation and re-categorisation of data and the iterative interrogation of findings. This study is no exception, and the refinement of the outcomes is embraced and expanded in the following chapter.

Chapter 7: The grammar of creative workplaces

7.1   Introduction

The previous chapters have set out the research data collected from the professional experience, the eleven research interviews, two focus groups, three case studies and five tests (three prototype tests in a US university and two final tests in UK organisations) and analysed through the constant comparator method of constructivist grounded theory (Charmaz 2000). The findings that have emerged from this iterative process have then been presented: a definition of physical press, the interaction model of creative behaviour, the concept of the creative footprint and the engage/disengage model of creative behaviour. The literature that underpins these findings has also been brought forward: the literature on creativity, on grammars and meaning, and on the senses as they relate to this study.

This current chapter is built upon the data and their analysis, and on the literature review, to propose a grammar of creative workplaces. In this chapter it is argued that this is a grammar rather than a taxonomic description, and that the grammar is generative. The place of pattern in the grammar is described, and related to the meaning that emerges from the grammar's construction. The grammar is thus positioned as a syntax-semantic generative grammar, that is, one whose grammaticality is dependent on clearly expressed meaning as well as its syntactic construction (in contrast to syntax-neutral generative grammar (Chomsky 1957) where grammatical correctness is syntax-rather than meaning-based).

7.2   The argument for a grammar

The question arises why the findings should call for a grammar of creative workplaces rather than a description of physical press's elements that help people access their creativity in the workplace. Might not a taxonomy of these elements be sufficient for designers and architects to use in the design of such spaces? It is suggested, however, that the three-part structure of a grammar: its lexis, syntax, and meaning, permits a dynamic interaction between lexis and syntax which in turn generates new structures. The purely descriptive nature of taxonomy does not necessarily enable people to create a workplace that can stimulate and sustain their day-to-day work creativity. A grammar with a generative syntax permits people – designers and workers – to identify the

elements necessary for their creativity, and look at how those elements work together for them.

Thus, when a work area is first designed the question needs to be asked what are the behaviours (including, but not limited to, specified work behaviours) that should be given space and catered for in this new workplace? At the same time the designer must take into account any specialist elements that need to be present in the design, particularly in a manufacturing environment where machinery must be set up in an efficient and effective way. Examples are found in the Toyota Production System (Ohno 1988) and in Lean manufacture (Womack et al 1990), approaches to manufacturing and overall performance that enhance performance through simplifying work processes. The workplace behaviours that need support are those that not only maintain work processes but tap into the creative processes of individuals and groups. Within the work processes are, among others, formal meetings, electronic communications, and individual and team working. Outside these prescribed processes lie the informal behaviours, often not noticed by people themselves, that actively contribute to creativity in the workplace. Behaviours such as the few minutes break from the desk taken to get a cup of coffee or go to the toilet, the casual chat round the coffee machine or water cooler, the lunch taken outside in the sunshine instead of at the desk. Behaviours such as the unarticulated needs that people have for privacy or quiet or being able to listen to their preferred kind of music.

These behaviours need appropriate places and equipment before they can happen. The places are essential – where can someone find a place to work in quiet when the open plan office has a higher than usual noise level (just before lunch, and just before home-time in FT2)? Where might they bump into colleagues unexpectedly and engage in conversation that is social and establishes links of trust and positive affect, and that also exchanges unexpected information about all aspects of the work? Equipment (affordances) is also essential. What is there in the workplace that affords the possibility of seeing what others are up to? Where can I go to get a visual sense of what another team or individual is working on, and how that impinges on my own work? What is happening in the office that affords me the possibility of encountering new ideas and information?

Over and above these behaviours and equipment (affordances) are the properties of the workplace. How does the workplace fully satisfy such human needs (Barrett & Barrett

2010) as the need for daylight and fresh air, for congenial colour schemes in the workplace, for views from windows and comfortable furniture, for a sense of liveliness and the ability to personalise individual and team space?

While a grammar necessarily includes a taxonomy or classification system in its lexis (linguistic grammars classify words into nouns, verbs, adjectives and so on) taxonomies are descriptive and do not include the active ingredient that permits structures to be built, that is, the syntax. In the same way that shape grammar (Stiny & Gips 1972; Knight 1999) uses Euclidean transformations as its active component, so in a grammar of creative workplaces the active ingredient, the syntax, is formed by the behaviours, identified in the data, of engagement and disengagement undertaken to stimulate and sustain creativity. Thus the proposition is that the elements of the physical work environment that actively support the creativity of the people working in it can be ordered according to the behaviour needed. For example, if a person needs to connect with their own cognitive processes in order to complete a piece of work, that behaviour necessitates a disengaging from their surroundings, context and colleagues. What does this disengaging mean in terms of place, affordances and the properties of the space? It might mean that there is a need for an informal seating area away from the main workplace where someone can move to with a laptop, leaving their open-plan office desk. It could also mean a need for social and managerial structure that allows them to go elsewhere, out of the office. It could mean that, not able to work elsewhere, they need to use headphones, or put a notice beside them on the desk asking not to be disturbed.

It is proposed, therefore, that the ordering of workspace elements that have emerged from the data as categories stimulating and supporting/sustaining people's work creativity is a grammar, rather than a taxonomy, in that new and unexpected combinations of elements can be formed. Expanding on this argument, the next section reviews the grammatical elements of meaning, syntax and lexis, introducing the grammar's generative structure.

7.3   The constituent parts of a grammar

This section examines each of the three elements of grammar in turn, starting with meaning, moving onto syntax and finishing with lexis.

7.3.1 Meaning in the grammar of creative workplaces

What is the meaning that arbitrates whether or not things are grammatical? In linguistics the ability to communicate between people is taken by construction grammar linguists to be an integral part of the grammaticality of a written statement (Lakoff & Johnson 1980/2003; Goldberg 1995; Langacker 2008). The exception to this is the generative (or transformational) grammar of Chomsky (1957) who avers that grammaticality is a property of the structure, not of whether or not it makes sense. This point has been explored in Chapter 2, Section 2.4.1, page 31.

In terms of a grammar of creative workplaces, meaning is held in the extent to which a space makes possible the creativity of its users and communicates that possibility to them. What is the quality of creativity that this space delivers and supports? To what extent does the space deliver and support creativity for all its users, not just some? The concept of the individual creative footprint emerged from the data categories set out in Chapter 5. Each respondent in the study, whether in the professional practice, the interviews, the case studies or the test phase, had a unique set of spatial and visual elements that stimulated and sustained their work creativity; and this unique set of elements is their creative footprint. While the elements that made up those creative footprints were held in common, the particular combination, and the use of that combination for different parts of the creative process and different work situations, was unique to each person. The meaning of a workplace, therefore, in terms of this study, is extent to which it supports the varied creative footprints of its users.

Can it therefore be said that meaning is held in the extent to which the workplace communicates with its users, to the extent to which users 'read' their workplace as being helpful to their creativity? In Chapter 3 the interaction between the different variables in a workplace – the people themselves, the physical environment or press, and the social press – was explored. It was concluded that the interaction between the three independent variables, and the weighting given to each by the organisation, mediates the behaviour of the workplace's users through the intervening or mediating variable of perception. Therefore the extent to which people perceive their own creativity and the possibility of creativity in the space, and are permitted (or indeed required) to be creative, affects the extent to which they are creative (Amabile 1983/1996; Amabile & Kramer 2011). While fully acknowledging the social and people issues, this thesis focuses on the aspects of physical press.

It is therefore suggested that in terms of creative performance the meaning of a workplace's physical press lies in the extent to which it enhances the unique creativity of its users. And that this creativity varies from one person to the next according to their creative footprint. Thus, Respondent 10's (the junior sales executive) creative footprint comprises engagement with colleagues casually and informally, in small groups and one-to-one. She prefers buzz levels of noise and a bright quirky environment, and only talks of disengaging from colleagues when she writes up ideas gained from the considerable levels of interaction she undertakes. Her creative footprint is very different from that of the Case Study 3 respondent (middle management engineer) who needs a totally quiet individual office where he is uninterrupted, and interacts with colleagues in a predominantly formal way. Yet another respondent in Case Study 3 (engineer manager) has as an essential element of her creative footprint the need to interact with colleagues informally and casually on a regular basis. This is regarded with suspicion by management: "I'm not sure, however, how much the middle level of management on the site see that as part of the job. I know that I have had comments made about me 'chatting'". This situation invokes the interaction model of creative behaviour (Chapter 3) in its tension between social press and people aspects.

The meaning attached to a physical environment in terms of a grammar of creative workplaces is therefore: given radically different creative footprints existing side by side in the same workplace, how might they each be accommodated, and more than that, enhanced and made complementary?

7.3.2 Syntax

The second element of the grammar of creative workplaces is its syntax. In grammars (linguistic and non-linguistic) the syntax is the rule set that orders the constituent parts of each grammar (Chapter 5). Hence in linguistics the constituent parts are phonemes and morphemes (words and phrases) and they are ordered by syntactic or grammatical rules that state, for example:

IF [precondition] → THEN [consequent]

which translates into linguistic rules (Chomsky 1957) as:

[Noun phrase] → [Article] [Noun]   (for example: The ball)
[Verb phrase] → [Verb] [Article] [Noun]   (for example: Hit the ball)

In shape grammar (Stiny & Gips 1972; Stiny 1980, 2006; Knight 1999) the constituent parts are shapes and the syntax is the Euclidean processes of '*translation, rotation, reflection, scale*, or finite *compositions* of them' (Stiny 1980: 344) whereby a shape can be transformed into other or composite shapes. In landscape grammar (*LG*) (Mayall & Hall 2005; 2007) the constituent parts are object types in a landscape (a tree, a fence, a building, a plot etc.) called *vocabulary* (*V*); the syntax is a set of rules (*R*) that order the objects, and the landscape scene (*S*) embodies the particular character that is being built by the landscape grammar. Thus, where (*IS)* is 'initial [landscape] scene':

(*LG*) = {*V, R, IS*}　　　　　　(Mayall & Hall 2005:899-900)

It is proposed that the syntax of the grammar of creative workplaces is formed from the engage/ disengage model of creative behaviours and on the linguistic syntax of IF [precondition] → THEN [consequent].   In this construct (IF) is a creative behaviour from the engage/disengage model of creative behaviours, and (THEN) is a pattern[21] of units of the physical press or environment that supports the particular creative behaviour of specific people. Thus:

IF → THEN

IF [creative activity] → THEN [pattern of supportive physical press]

Expressed differently: "IF people want to engage in a creative behaviour, THEN they need a supportive physical space in which to do so."

 The engage/disengage model of creative behaviours posits that, in order to be creative, people undertake one of a finite number of creative behaviours. These are, firstly, to engage with people, with information and with ideas, both deliberately seeking them out and serendipitously encountering them. Secondly, to disengage from others the better to engage with their own thinking, to concentrate and to engage cognitively through quiet and private solo working; and finally to disengage from the issue or problem at hand, walking away from it for a few minutes to refresh their minds in whatever way they find works for them. This disengagement from the issue may be of short (a few minutes) or long (hours or days) duration.

When the users of the space are at different creative process stages, or have differing creative footprints, they may be undertaking different creative behaviours from those of

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[21] This term will be explored fully in the next section

their colleagues, but at the same time. This will necessitate a variety of spaces: spaces for engaging informally with others, and for disengaging from others and the surrounding environment. It can be posited that there will be overlapping creative footprints and creative process stages in any work environment. Each of the six main categories in the engage/disengage model of creative behaviours becomes a need (IF), with concomitant sub-needs. Under engage come the subheadings of formal and informal and of engaging deliberately and by chance. Under disengage come the subheadings of disengagement from the issues through movement (physical and mechanical) and time (short and longer), and disengagement from the context (for better cognitive engagement) through context-related means (from going elsewhere to putting on headphones). Within each of these headings there are many possibilities which will depend on the specific workplace. It is argued, however, that each workplace holds the potential for satisfying all the elements of the diverse creative footprints of its staff because those elements are in fact held in common. How these patterns of meaning (IF → THEN) are created through the syntax and lexis is set out in Section 7.4 below.

7.3.3 Lexis

The third element of the grammar of creative workplaces is its lexis, or constituent parts. The elements of physical press identified in the data (Chapter 5, Sections 5.2.1 page 91 and 5.3.3 page 108) are proposed as these constituent parts. These are the *place* itself: where and what it is; its *properties*: is it, for example, light or dark, noisy or quiet, comfortable or not; and the *affordances* within it that support the creative behaviours of the syntax.

The three parts of the lexis act in different but interrelated ways. First, the place itself speaks to the need for a variety of spaces for the wide range of creative behaviours that need to take place within it, from formal boardroom to standard office workstation desk to casual mingling points round the water cooler. Next, the properties of the place are sensory, and can be posited to be hygiene factors (Herzberg 1959, 1987) that create a positive affective environment in the workplace, with a traceable correspondence between mood and creative output (De Dreu, Baas & Nijstad 2008; James, Brodersen & Eisenberg 2004). There are, as seen in Tables 17 and 18 (pages 113-114), twelve distinct sensory categories brought forward in the data analysis which come together into six meta-categories: comfort, sight, spaciousness, sound, movement and aliveness. Comfort subsumes touch, taste, smell and temperature; aliveness includes the sense of

thinking, of speech, of life (being alive) and of 'the I' (ego); movement includes balance and proprioception; while sight, sound and spaciousness stand on their own, with direct subcategories rather than subsumed related ones. Finally, the affordances in a workplace are those furnishings and equipment that support creative behaviours. These include people's ability to engage with people, information and ideas (for example, through visual displays or shared diagramming) or to disengage from the issue or from the environment (through, for example, movement or daydreaming).

There is significant cross-over between the three parts of the lexis. An informal meeting room (place) may need to include whiteboards and flip charts (affordances) for visual engagement with ideas, and have good air quality and natural light (properties) to sustain concentration.

This section has reviewed the grammatical elements of meaning, syntax and lexis. In doing so it has introduced the grammar's generative structure of IF→THEN. The next section examines this structure, introducing grammaticality, and looking at the place of creative processes within the grammar.

7.4 Grammar Structure

Each of the creative behaviours in turn can be said to be a need (IF) with subcategories of that need. The satisfying of these needs (THEN) is realised by the lexis, hence:

IF →	**THEN**
(engagement) (deliberate/chance)	**(place) (properties) (affordances)**
(people/information/ideas)	

IF →	**THEN**
(disengagement)	**(place) (properties) (affordances)**
(movement: physical/mechanical)	
(time: short/long)	

For example:

IF (creative behaviour) →	**THEN (pattern of physical press)**

IF →	**THEN**
(chance engagement)	(Attractor place: e.g. print/kitchen space with the
(with people) (for information)	sensory properties of comfort, spaciousness and
	aliveness, and affordances for printing/photocopying
	and coffee/tea making, and notice board with internal
	and external information[22])

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[22] Final Test 2 office had just such a space designed into the overall office layout (without the notice boards) where interviewees reported having useful chance engagements with colleagues

Where there are potentially different creative footprints for the same need (IF), there may be a variety of satisfiers (THEN) of that need. For example, where people need to disengage from the issue for a short (minutes) period of time, there may be some whose disengagement is through a shift of visual focus, and others whose disengagement is by physical movement:

IF (creative activity) →	THEN (pattern of physical press)	Lexical elements
IF → (disengagement from the issue for short periods of time)	THEN (in fixed place: open-plan office) [where the person has little or no choice of place]	Place
(a shift of visual focus)	(a view to the outside) (long internal isovists) (images on the walls and personalised workstations)	Properties: • sight • spaciousness • aliveness
(physical movement)	(internal walks to attractors)	Affordances

The right-hand column sets out the lexical elements that the satisfier (THEN) calls forward.

7.4.1 Grammaticality

For a linguistic sentence to be grammatically correct it must convey a meaning[23] that is understood by a native speaker, and can communicate thought between people. It may also be an expression of experience (Goldberg 1995), and even the construing of that experience itself (Halliday & Matthiessen 1999). The ordering of the creative workplace's lexis through the syntax of the engage/disengage model of creative behaviours also depends for its grammaticality on an expressed and understandable meaning. This meaning is: whether the space supports an enhanced quality of creativity in its users. Without an active enhancement of the capacity of the workplace to stimulate and support the creativity of its users, then the syntactic ordering of the lexis can be said to be meaningless, and hence ungrammatical, in terms of creativity. A physical space may hold different kinds of meaning as explored in the literature review. Architectural meaning is seen as *beauty* (Palladio 1570; Le Corbusier 1923/2007; Ching 1979); performance meaning, for example where manufacturing plant and equipment is

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[23] With the exception of syntax-neutral generative grammar (Chomsky 1957), in which a sentence can be grammatically (syntactically) correct without meaning. The Chomskian position is that the sentence *Colourless green ideas sleep furiously* is syntactically acceptable in a way that *Furiously sleep ideas green colourless* is not (Chomsky 1957).

ordered according to a Lean production plan (Womack, Jones & Roos,1990) is seen as efficient production. Creativity meaning in the workplace, however, is a deliberate crafting of creativity potential through a conscious process. Therefore the following ordering is syntactically and grammatically correct within the terms of a grammar of creative workplaces:

(IF) → (THEN) = Enhanced possibility of creativity for an individual or group/team.

The qualification 'possibility' reflects the weighting given to the independent variables of people, physical press and social press in the Interaction Model of Creative Behaviour (Chapter 3). When the weightings are evenly balanced the possibility of creative behaviour and hence creative output is enhanced. When the weightings are uneven, for example where the physical press holds high creative potential, but the social press limits creative behaviours, then people's perception of that limitation (the intervening or mediating variable) will tend to adversely affect their creative behaviour (Dul et al 2011; Amabile 1996, Amabile & Kramer 2011).

Unlike a linguistic language where each communication of meaning is different, in the grammar of creative workplaces the meaning is constant:

To what extent does this configuration of IF → THEN actively enhance the creativity of people working in the space?

In this sense, meaning is equivalent to a concrete outcome. A further consideration of this meaning must be:

To what extent does this configuration of IF → THEN actively enhance the creativity of people working in the space *without compromising the creativity of others whose creative footprint is different?*

The expression of that meaning, however, is not constant. As set out in Chapter 5 each person in a workplace will have a different (however slight) creative footprint from those around them. One person may want to work with the radio on while people at neighbouring desks dislike his choice of music (Case Study 1), another person prefers silence (Final Test 1), while yet another needs the quiet buzz of a busy office (Final Test 2). Some people may need to be able to see other people across the desks of an open-plan office (R10; FT1) while others prefer the seclusion of a single-person office (Case

Study 3). Therefore the meaning of a good quality of creative support will be expressed differently for different creative footprints.

The creative footprint also has to contain flexibility for the different creative processes used at different stages of tackling an issue or problem. The following section looks at them within the grammar of creative workplaces.

7.4.2 Grammar and creative processes

There are three main types of creative process: the individual creative process (Wallas 1926; Evans & Russell 1989; Csikszentmihalyi 1996), the group creative process (Tatsuno 1990) and the iterative creative process (Resnick 2007; Sawyer 2003) in which ideas are built in a recurring iterative loop between individual and group (Table 3, page 17). A grammar of creative workplaces addresses the physical press that will support and sustain all three.   Further considerations of the meaning of a grammar of creative workplaces are therefore:

> To what extent does this configuration of IF → THEN actively enhance the creativity of people in the workspace *through all the stages of their creative process with the different needs at each stage?*

In the individual creative process a person may need to be able to walk outdoors alone at the idea-generating stage, have conversations with others as the ideas develop, and work collaboratively with an expert at the completion stage (R11, the film director). Another may need to have chance conversations with colleagues as her ideas start to form, before building them on her own in development, and finally working with others towards completion or *verification* (Wallas 1926) (Case Study 3).

Thus, the application of a grammar of creative workplaces brings into consideration the effect of the IF → THEN syntax/lexis conjunction on:

1. The creativity of an individual
2. The creativity of that individual at different stages of the creative process
3. The creativity of others working with, or in proximity to, that individual whose creative footprint may be different at all or some of their creative process stages

The creativity of groups and teams is also receptive to the use of a grammar of creative workplaces. For example, teams at different levels of creative behaviour and output populate their team spaces in ways that reflect their creative abilities (McCoy 2000),

calling forward the lexical property of aliveness (e.g. in Prototype Test 1). The issues inherent in team communication (for example in Case Study 2; Final Test 1; R3; R10) and between teams (R2) are seen as an integral part of the syntax in 'engage deliberately with others'. The grammaticality of IF → THEN for a group or team is therefore:

IF → THEN = Optimal creative behaviour within and between teams

The iterative creative process combines the creativity of the individual and the group, with ideas moving freely between the two. In order to support this, the physical workplace requires the necessary places where this can happen (for example the easily accessible small meeting rooms of FT2 for individual and group work) and supportive affordances (for example, the pin-up boards in PT2 for visual display and information-sharing). The grammaticality of IF → THEN for iterative creativity between an individual and a group or team is therefore:

IF → THEN = Optimal creative behaviour between individual a group.

The following section explores how grammaticality within the grammar of creative workplaces is expressed and developed.

7.5   Writing 'sentences' in the physical press

There are many different 'words' in the grammar of creative workplaces' lexis, and different syntactic 'phrases'. This section considers how they are chosen so as to express meaning, that is, to optimise workplace creativity.

IF (syntax) → THEN (lexis) can be broken down, as we have seen above, into:

IF (engagement) (deliberate/chance) (people/information/ideas)
THEN (place) (properties) (affordances)
and:
IF (disengagement) (movement: physical/mechanical) (time: short/long)
THEN (place) (properties) (affordances)

In this section firstly the syntax is examined and its categories and subcategories set out, then secondly the lexis is considered and a patterning approach proposed.

7.5.1 *Syntax*

In the syntax the first division is between the intentions of engaging with or disengaging from people, information and ideas, with/from the problem, and with/from the context:

IF (E) or (DE)

IF (Engagement) or (Disengagement)

The intention is a precursor to an action or the undertaking of a creativity-spurring behaviour. There are subsets of each engagement or disengagement intention:

	Engagement		**Disengagement**
(E₁)	Engagement/deliberate	**(DE₁)**	Disengagement/short time (minutes)
(E₂)	Engagement/chance	**(DE₂)**	Disengagement/longer time (hours/days)
(P)	With people	**(P)**	From people
(IN)	With information		
(ID)	With ideas		
(PR)	With the problem	**(PR)**	From the problem or issue
(C)	With the context	**(C)**	From the context or environment

Table 41: Subcategories of engagement and disengagement actions

Information is absorbed and processed in different ways and the research data categories indicate that the predominant methods used by respondents are auditory, visual and kinaesthetic (Fleming 2006; Fleming & Baume 2006).   This categorisation is therefore adopted for the grammar; engagement with or disengagement from people, information, ideas, problem and context is seen to take place in these three ways:

(A) Auditory

(V) Visual

(K) Kinaesthetic

Each is employed in both engagement and disengagement; for example auditory engagement with people commonly takes the form of conversations, while auditory disengagement is often demonstrated through the use of headphones to screen out office noise and indicate non-availability (visual subcategory).   Visual engagement with information may be through notice boards or information screens, while visual disengagement may be through gaze (for example contemplating a view). Kinaesthetic engagement with ideas may be through drawing diagrams, while kinaesthetic

disengagement is often done through physical movement (for example walking to get a coffee).

Engage or disengage is indicated by (E) or (DE) in front of the units set out here. Auditory engagement is seen to be through conversation and can be formal or informal and can take place face-to-face or electronically. Thus:

$\quad$ (E) (A_f) formal conversation face-to-face

$\quad$ (E) (A_{in}) informal conversation face-to-face

$\quad$ (E) (A_{fe}) formal conversation electronically

$\quad$ (E) (A_{ine}) informal conversation electronically

Auditory disengagement takes place through 'screening out the noise' cognitively, through the use of headphones to deliver noise-cancelling music and a sign that the person should not be interrupted (visual subcategory link), and through moving to a quieter location (kinaesthetic subcategory link). Thus:

$\quad$ (DE) (A_{sc})   Screening cognitively

$\quad$ (DE) (A_{shp}) Screening with headphones

$\quad$ (DE) (A_{sm}) Screening by moving to alternative space specifically to reduce noise (kinaesthetic link)

Visual engagement can be either passive (for example, seeing displays of information) or active, as when people are working with others to produce graphic and visual thinking. This can be either face-to-face or electronic (by, for example, multi-touch, multi-user table top devices and other emerging electronic tools that allow for distributed group visual work) and translates into the syntax as:

$\quad$ (E) (V_p) passive visual engagement

$\quad$ (E) (V_a) active visual/graphical engagement

Visual disengagement shows itself through gaze. A person will disengage from their surroundings through letting their eyes rest on a view or the external context, on an internal vista (isovist), on an image on the wall or computer screen, or on nothing in particular in the middle-distance. Gaze differs from a stare in that the gaze is used in an unfocused way of distracting themselves from their immediate surroundings, rather than actively focusing on something or someone. Gaze in this sense is a neutral physiological phenomenon rather than as a phenomenon of psychotherapy (Lacan 1988), power (Foucault 1977) or feminist critique (Mulvey 1975).

Kinaesthetic engagement is most often seen as activities undertaken between two or more people. In physical movement people will walk together in discussion (for example in a "walking meeting" (R5)), or thinking well in a group while moving within the meeting place. Kinaesthetic behaviours such as making images or diagrams on whiteboards and flipcharts, or crafting, building, prototyping and playing (solo or as a group) have strong links to the visual behaviours and vice versa.

Kinaesthetic disengagement is most often a solo activity, whether the disengagement is for a matter of minutes (short time) distraction, or hours or days (longer time) when the issue is committed to the intelligent unconscious or under-mind (Claxton 1997). Physical movement shows up as a solo activity with short walks within a work environment to do such things as get a coffee, go to the toilet, or have a cigarette. Mechanical movement through different forms of transport is seen as a way of productively disengaging from the work environment, allowing uninterrupted thinking time. Changing from one task to another is a reported mechanism for short disengagements. Allowing the under-mind to process information and ideas overnight in sleep, or more briefly through day-dreaming is again a solo activity. And finally the proximity to water, whether in bath, shower or swimming, walking by it or sitting contemplating it, is often cited as a productive mental disengagement that stimulates creative inspiration. The subsets of each approach to engagement and disengagement are set out as follows:

Auditory engagement (E)

(A_f)	Formal conversation face-to-face
(A_{in})	Informal conversation face-to-face
(A_{fe})	Formal conversation electronically
(A_{ine})	Informal conversation electronically

Auditory disengagement (DE)

(A_{sc})	Screening cognitively
(A_{shp})	Screening with headphones
(A_{sm})	Screening by moving to alternative space specifically to reduce noise (kinaesthetic cross-link)

Visual engagement (E)

(V_p)	Passive visual engagement
(V_a)	Active visual/graphical engagement

Visual disengagement (DE)

(V_g)	Gaze

Kinaesthetic engagement (E)

(K_{pm})	Physical movement (group)
(K_{ic})	Image creation
(K_t)	Thinking on your feet
(K_c)	Crafting/building/playing

Kinaesthetic disengagement (DE)

(K_{pm})	Physical movement (solo)
(K_{mm})	Mechanical movement (transport)
(K_t)	Task change
(K_s)	Sleep/daydream
(K_w)	Water

Table 42: Engagement and disengagement through auditory, visual and kinaesthetic activities

The syntax therefore can be divided into two complementary elements: a) the intention: that is, engagement or disengagement, and with or from what; and b) the means

whereby that intention is carried out: that is, through an auditory, a visual or a kinaesthetic behaviour:

IF (intention) (behaviour)

The ordering of the syntax is governed by the rule that intention precedes behaviour, in that unless the intention is clear, then the appropriate behaviour may not be identified. It is therefore:

1. Intention: Engage or disengage and the manner of it (deliberate/chance) or(short/long time) + With or from what (people/information/ideas/problem/context)
2. Behaviour (auditory/visual/kinaesthetic)

Once the behaviours of engagement and disengagement are set out and codified it becomes possible to write the first half of 'sentences', for example:

IF $(E_1 + P + IN)$ $(A_{in} + V_p)$

That is: Deliberate engagement with people and information through informal conversation and passive visual forms

IF $(DE_1 + PR + C)$ (K_{pm})

That is: Disengagement from the problem and the context/environment for a short time through physical movement (kinaesthetic)

Combinations of engagement and disengagement intentions and behaviours describe elements of people's creative processes.

The next constituent part of the grammar, its lexis, is considered in the following section.

7.5.2 *Lexis in the grammar of creative workplaces*

This section's exploration of the act of 'writing sentences' in the grammar of creative workplaces has examined syntax and how it is structured into intention and behaviour. The lexis of the grammar of creative workplaces is now considered.

The lexis comes from the definition of physical press, generated by the research data:

Physical press is composed of the three elements of the place itself (what and where it is), its properties (predominantly sensory) and its affordances.

Therefore: IF (syntax) → THEN (lexis) can be broken down into:

IF (engagement: deliberate/chance + people/information/ideas/problem/context)
(auditory/visual/kinaesthetic) → **THEN** (place) (properties) (affordances)
and:

IF (disengagement: short/long time + people/problem/context)
(auditory/visual/kinaesthetic) → **THEN** (place) (properties) (affordances)

The literature review of grammars (linguistic and non-linguistic) points to the division between syntax-neutral generative grammars (Chomsky 1957; Stiny 1980; Knight 1999) where grammaticality is held to be possible independent of meaning, and syntax-semantic construction grammars (Alexander et al 1977; Alexander 1979; Sass 2007; Langacker 2008) where meaning is an integral part of grammaticality. The integration of generative and construction grammars is inferred in landscape grammar (Mayall & Hall 2005, 2007) and Stiny's (2006) later work. Here meaning becomes an integral part of grammaticality, and of the purpose and intention of the grammars. In a parallel approach, explored by Duarte & Belrão (2007) and Paio & Turkienicz (2009), patterns in Alexander's terms are combined with generative syntax to create designs for new towns and spaces.

These approaches are called forward and adapted by the grammar of creative workplaces. It is proposed that that the lexis consists of units (derived directly from the data) and that appropriate combinations of those units form patterns for a given response to a creative need that has been identified by the generative syntax.

The lexis is, therefore, a series of related units which form part of the language of creative workplaces, identified and ordered by its grammar into patterns of physical press that actively support creativity in the workplace. Patterns are examined in the following section, and their origins (for this research) in 'pattern language' is described.

7.6 Patterns of place, properties and affordances

The lexis is a series of units, organised in categories. When these units are brought together purposively they form patterns. These patterns are governed by and satisfy the syntax and thus create meaning in terms of the quality of stimulation and support for creativity the workplace can deliver. This pragmatic meaning is context-dependent.

This approach, while owing much to the work of Alexander and his colleagues (Alexander et al 1977; Alexander 1979), has a generative as well as a construction basis. In *A Pattern Language*, Alexander et al describe:

> [The] 253 patterns that together form a language. They create a coherent picture of an entire region, with the power to generate such regions in a million forms, with infinite variety in all the details. It is also true that any small sequence of patterns from this language is itself a language for a smaller part of the environment; and this small list of patterns is then capable of generating a million parks, paths, houses, workshops or gardens. (1977: xxxv)

As seen in this quotation, the patterns are ordered hierarchically by scale, starting at a regional level (for example, *Independent Regions* Pattern 1; *Country Towns* Pattern 6) and ending up in close consideration of detail such as *Different chairs* (Pattern 251) or *Paving with cracks between the stones* (Pattern 247). Each pattern is described in detail, starting with its rationale then exploring the research and thinking that has gone in to its development, and ending with the recommendation that forms the pattern. For example, *Pattern 183: Workspace Enclosure* starts by stating 'People cannot work effectively if their workspace is too enclosed or too exposed. A good workspace strikes the balance' (Alexander et al 1977: 847) and after four pages of closely argued research concludes:

> Give each workspace an area of at least 60 square feet. Build walls and windows round each workspace to such an extent that their total area (counting windows at one-half) is 50 to 75 per cent of the full enclosure that would be there if all four walls around the 60 square feet were solid. Let the front of the workspace be open for at least 8 feet in front, always into a larger space. Place the desk so that the person working at it has a view out, either to the front or to the side. If there are other people working nearby, arrange the enclosure so that the person has a sense of connection to two or three others; but never put more than eight workspaces within view or earshot of one another. (Alexander et al 1977 846-851).

The patterns of pattern language are linked to each other; thus the language of the workspace although starting from *Pattern 183: Workspace Enclosure,* references other patterns such as *Windows overlooking life* (Pattern 192), *Flexible office space* (Pattern 146), *Open shelves* (Pattern 200) and *The shape of indoor space* (Pattern 191). Each pattern is complex, describing an area or aspect of an area in detail. The bringing together of a cluster of patterns forms the language of a specific bit of the built

environment. For example, a list of ten patterns[24] is cited which 'is itself a language: it is one of a thousand possible languages for a porch, at the front of a house. One of us chose this small language, to build a porch onto the front of his house' (Alexander et al 1977: xxxv-xxxvi).

In the grammar of creative workplaces, however, the patterns are the end result of the ordering of the units through the syntax. Each pattern can be said to be a sentence written through the grammar of creative workplaces. The meaning and grammaticality of the sentence or pattern–the final outcome–is the workplace users' increased perception of being supported in their creative behaviours.

As stated, the lexis of the grammar of creative workplaces is made up of units which have emerged directly from the research data. These units are organised by category and subcategory: at the meta-level are the three categories of physical press: place (subdivided into workplace and non-workplace) properties and affordances. These meta-categories then sub-divide further. Place (workplace and non-workplace) is made up of ten subcategories, properties has six, and affordances has five. Each subcategory contains up to ten units each. There are 120 units in all.

Categories, subcategories and units are each numbered, and throughout this text will be set out in small upper case with its reference number succeeding it in brackets as:

SOUND (12)

The numbers after each unit refer to their place in the unit tables. These units are listed in Tables 43 (page 206), 44 (page 207), 45 (page 209) and 46 (page 210) and itemise each of lexical unit numbers. The three meta-level categories are indicated by lower case italics without numbering:

Place

Properties

Affordances

Thus in the section on *place* the category of INFORMAL SPACES AT WORK FOR DISENGAGEMENT/PRIVACY (3) has five separate units that include: CUBICLE AREA (3.1), SMALL TABLE WITH SINGLE CHAIR (3.5), SCREENED-OFF AREA IN OFFICE (3.2).

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[24] *Private terrace on the street* (140); *Sunny place* (161); *Outside room* (163); *Six-foot balcony* (167); *Paths and goals* (120); *Ceiling height variety* (190); *columns at the corners* (212); *front door bench* (242); *raised flowers* (245); *and Different chairs* (251) (Alexander et al 1977: xxxv).

A single unit is, for example: DEDICATED HOME OFFICE (5.4). A combination of units is for example: SINGLE SEAT (20.4) BY WATER (8.2). Other patterns are more complex and are formed from the bringing together of several units. For example PRIVATE SPACE (3) might be made up of SMALL TABLE WITH ONE CHAIR (3.5), VIEWS (EXTERNAL) (13.1), QUIET BUZZ (12.5), LIFE (FEELING ALIVE) (16.3) and COLOUR (HUE) (13.5).

Each sub-division contains between two and ten units that set out the detail of the lexis. *Place* contains 61 units, *properties* contains 34 units, and *affordances* 25 units. Each unit is, in its turn, flexible according to what is appropriate to the creativity of the individual, the team and the organisation as a whole. For example, WORK CANTEEN (2.4) is occasionally set out in round tables to encourage conversation, supporting work creativity, but more often set out in ranked refectory tables (CS3) which, while not excluding conversation, do not encourage lingering over lunch. WORK CAFE (2.5) on the other hand is more likely to have small round tables where informal or spontaneous ("Let's grab a coffee") meetings can take place (CS2, FT1).

7.6.1 Units of place

In *place* there is a clear division between work creativity that happens inside the workplace during work hours, and work creativity that happens outside the workplace and/or outside work hours.

Those divisions sub-divide further. The workplace sub-divides into a) OFFICIAL WORKSPACES (1) that is, the space that is dedicated to carrying out the work in hand, predominantly offices in this study (with a few specialist rooms such as Control Room and laboratory); b) SEMI-OFFICIAL WORKSPACES (2) such as meeting rooms, nurture spaces such as work cafe and canteen and chill-out spaces (sofas and comfortable chairs); c) INFORMAL SPACES AT WORK FOR DISENGAGEMENT AND PRIVACY (3) such as screened off areas in larger spaces, alcoves in corridors and small single-user tables; and d) INFORMAL SPACES AT WORK FOR ENGAGEMENT (4) which are often *attractors,* such as a well-placed coffee machine or water cooler.

Units of Place: Workplace

---

1.   OFFICIAL WORKSPACES (DEDICATED WORKSTATIONS)

1.1 OPEN PLAN OFFICE 50-100+
1.2 OPEN PLAN OFFICE 9-50
1.3 TEAM AREA WITHIN OPEN PLAN OFFICE
1.4 SHARED OFFICE < 9
1.5 SINGLE PERSON OFFICE
1.6 SPECIALIST WORK SPACE (EG LABORATORY)

2.   SEMI-OFFICIAL WORKSPACES

2.1 LARGE FORMAL MEETING ROOM (INCLUDING BOARDROOM)
2.2 SMALL MEETING ROOM (UP TO 12 PEOPLE) MUST BE BOOKED
2.3 SMALL MEETING ROOM (UP TO 12 PEOPLE) NO BOOKING
2.4 WORK CANTEEN
2.5 WORK CAFE
2.6 OFFICE KITCHEN SPACES
2.7 PHOTOCOPIER ROOM
2.8 PRINTER ROOM
2.9 CHILL-OUT AREAS/SOFAS

3.   INFORMAL SPACES AT WORK (FOR DISENGAGEMENT/PRIVACY)

3.1 SMALL CUBICLE
3.2 SCREENED OFF AREA WITHIN OPEN PLAN OFFICE
3.3 ALCOVE CREATED IN A CORRIDOR
3.4 ARMCHAIR IN OPEN PLAN OFFICE BY WINDOW
3.5 SMALL TABLE WITH SINGLE CHAIR

4.   INFORMAL SPACES AT WORK (FOR ENGAGEMENT)

4.1 SMALL TABLE WITH 2 OR 3 CHAIRS
4.2 COFFEE MACHINE
4.3 WATER COOLER
4.4 PHOTOCOPIER
4.5 PRINTER
4.6 CORRIDORS
4.7 STAIRCASES
4.8 SMOKERS' CORNER

Table 43:   Units in the meta-category PLACE, subcategory OFFICIAL WORKPLACE

Each of these units emerges from the data, being reported by respondents as actively supporting their work creativity in one or more stages of their particular creative process. The concept of the creative footprint also governs these units, pointing out that some may inhibit as well as support creativity. For example SMALL CUBICLE (3.1) emerges in the data as an inhibitor at the stimulate stage of the creative process, and a support at the development stage.

Units of Place: Non-workplace

> **5. DOMESTIC SPACE**
>
> 5.1 AT HOME IN THE LIVING ROOM
> 5.2 AT HOME IN THE BEDROOM
> 5.3 AT HOME IN THE BATHROOM
> 5.4 AT HOME IN DEDICATED HOME OFFICE
> 5.5 AT HOME IN THE GARDEN
>
> **6. PUBLIC SPACE**
>
> 6.1 MUSEUM
> 6.2 LIBRARY
> 6.3 ART GALLERIES
> 6.4 MUSIC VENUE
> 6.5 SWIMMING POOL
>
> **7. COMMERCIAL SPACE**
>
> 7.1 CAFE/COFFEE SHOP
> 7.2 RESTAURANT
> 7.3 HOTEL
> 7.4 CONFERENCE CENTRE
> 7.5 PUB
> 7.6 AIRPORT LOUNGE
> 7.7 RAILWAY STATION
>
> **8. OUTDOOR SPACE**
>
> 8.1 MOUNTAINS AND HILLS
> 8.2 BY WATER (SEA/LAKE/RIVER/POND)
> 8.3 WOODLAND/FOREST
> 8.4 STREET (MOVING)
> 8.5 STREET (SEATED)
> 8.6 PARK (MOVING)
> 8.7 PARK (SEATED)
> 8.8 SQUARE (MOVING)
> 8.9 SQUARE (SEATED)
> 8.10 ANY BUSY PUBLIC PLACE
>
> **9. TRANSPORTATION**
>
> 9.1 CAR
> 9.2 BUS
> 9.3 TRAIN
> 9.4 AEROPLANE
>
> **10. OTHER**
>
> 10.1 ANYWHERE/EVERYWHERE
> 10.2 ANYWHERE/ALWAYS

Table 44: Units in the meta-category PLACE, subcategory NON-WORKPLACE

As seen in Chapter 5: Findings, much creative activity happens outside the workplace. There are two main reasons for this: the incubation/illumination stages (Wallas 1926; Evans & Russell 1989) can occur at any time, hence there are repeated references to ideas occurring, for example, on the cusp of sleep, or while out walking. Secondly

people avoid, where they can, workplace environments that hinder their creative thinking and remove themselves to cafes and restaurants for more productive meetings, or to find space where they will not be interrupted[25]. Additionally there are an increasing number of people whose main work place is in the home in a dedicated home office.

In total there are 61 units in the meta-category of *Place.*

7.6.2 *Units of properties*

The units of *Properties* are all sensory. The literature of these senses is set out in Chapter 5, and the three foundations of this meta-category are the five Aristotelian senses (taste, smell, touch, sight, sound), the neurological senses of spaciousness and movement, and the Steinerian senses of speech, thinking, life (feeling alive) and the I (ego). These have been brought together as six sensory meta-categories of COMFORT (11), SOUND (12), SIGHT (13), SPACIOUSNESS (14), MOVEMENT (15) and ALIVENESS (16).

Each unit of properties has been tested through a semantic differentiation scale (Mehrabian & Russell 1974). This is set out in the brackets after each unit, where the left-hand phrase is the least desirable, and the right-hand phrase the most desirable for creative performance in the workplace.

Each of the thirty-four units in *Properties* emerges from the research data (Chapter 5) and is supported by the literature (Table 19 page 115 and Appendix 16).

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[25] An ancillary reason is given by the creatives in the Case Study 1 advertising company, who will go to museums and art galleries etc looking for inspiration.

Sensory Unit	Semantic Differential Scale (0 – 4)

11. COMFORT

11.1	TASTE & SMELL	[Unpleasant – Fresh]
11.2	TOUCH (DESKS)	[Extremely uncomfortable – Very comfortable]
11.3	TOUCH (CHAIRS)	[Extremely uncomfortable – Very comfortable]
11.4	TOUCH (OTHER FURNITURE)	[Extremely uncomfortable – Very comfortable]
11.5	TEMPERATURE	[Extreme (too hot/cold) – Just right]
11.6	AIR QUALITY	[Stuffy and airless – Fresh not draughty]

12. Sound

12.1	NOISE/DISTRACTION LEVELS	[Distractingly noisy – quiet buzz]
12.2	NOISY EQUIPMENT (e.g. photocopier)	[Distractingly noisy – quiet buzz]
12.3	SILENCE	[Completely silent – quiet buzz]
12.4	QUIET	[Distractingly noisy – quiet buzz]
12.5	QUIET BUZZ	[Distractingly noisy – quiet buzz]
12.6	BUSY-NESS	[Distractingly noisy – quiet buzz]

13. Sight

13.1	VIEWS (EXTERNAL)	[No views: no windows – Wide/far-reaching views]
13.2	VIEWS (INTERNAL)	[Less than 2 ft – long (over 20ft approx.)]
13.3	NATURAL LIGHT (level incl glare)	[No natural light – Floods the space without glare]
13.4	ARTIFICIAL LIGHT (level incl glare)	[Glaring – replicates daylight]
13.5	COLOUR (HUE)	[Extremely bright – Calm]
13.6	COLOUR (SATURATION)	[Monotonous (drab) – Cheerful]
13.7	DECOR	[Extreme – too bright/drab – Calm]

14. Spaciousness

14.1	LONG ISOVISTS (line-of-sight)	[Less than 2 ft – long (over 20ft approx.)]
14.2	DESK CONFIGURATION (cramped/spacious)	[Bump into neighbours – Lots of elbow room]
14.3	CEILING HEIGHT	[Approx 10 ft or below – Above 10 ft approx.]
14.4	MESSINESS (NEGATIVE/POSITIVE)	[Very messy – Orderly]
14.5	ORDERLINESS (POSITIVE)	[Very messy – Orderly]
14.6	ORDER (NEGATIVE)	[Regimented – Orderly]
14.7	CLEANLINESS	[Dirty – Very clean]

15. Movement

15.1	BALANCE & ACCELERATION	[Walking for very short distances only – Walking extensively]
15.2	PROPRIOCEPTION	[Walking for very short distances only – Walking extensively]

16. Aliveness

16.1	SPEECH (PERMISSION)	[Completely silent – quiet buzz]
16.2	THINKING (REFLECTION)	[Distractingly noisy – quiet buzz]
16.3	LIFE (FEELING ALIVE) (PLAY/FUN/LAUGHTER)	[Extremes of noise/silence – quiet buzz]
16.4	THE I (EGO) PERSONALISED SPACE (INDIVIDUAL)	[No personalisation – A lot]
16.5	THE I (EGO) PERSONALISED SPACE (TEAM)	[No personalisation – A lot]

Table 45: Units in the meta-category PROPERTIES

7.6.3 Units of affordances

The final meta-category of units is *Affordances*. Gibson (1977) defined affordances as those things (perceived or not) that afforded the possibility of action. His definition, based on psychological as well as physiological approaches to perception, extended beyond humans to all animals, but this study is concerned purely with the human context. An affordance is taken to be the tools and equipment that support the creative behaviours set out in the engage/disengage model of creative behaviours.

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17. VISUALISATION (ACTIVE ENGAGEMENT)

17.1 WHITEBOARDS
17.2 WHITEBOARD WALLS
17.3 FLIP CHARTS
17.4 STATIONERY MATERIALS (POST-ITS, MARKER PENS ETC)
17.5 PIN BOARDS
17.6 MAGNETIC WALLS AND BOARDS

18. VISUAL INFORMATION (PASSIVE ENGAGEMENT)

18.1 DISPLAY – LOW-TECH (POSTERS, WALL DISPLAYS ETC)
18.2 DISPLAY – HIGH-TECH (SCREENS)
18.3 SHELVES AND BOOKCASES
18.4 DISPLAY CASES

19. ELECTRONIC

19.1 TELEPHONE
19.2 MOBILE
19.3 COMPUTERS (FIXED AND LAPTOP)
19.4 GOOD FAST INTERNET ACCESS
19.5 COLLABORATION PROGRAMMES
19.6 PROJECTOR
19.7 TECHNOLOGICAL COLLABORATION TOOLS E.G. MULTI-USER MULTI-TOUCH TABLE TOP

20. ENGAGEMENT/DISENGAGEMENT

20.1 SMALL TABLES
20.2 EASILY MOVED CHAIRS
20.3 MEDICINE BALLS
20.4 SINGLE SEAT
20.5 SOFA

21. ORDERLINESS

21.1 CLEAR DESK AVAILABILITY SIGNAGE (FOR HOT-DESKING)
21.2 STORAGE (CABINETS)
21.3 STORAGE (ROOM)

Table 46: Units in the meta-category AFFORDANCES

Thus, under VISUALISATION (17) sit such units as WHITEBOARDS (17.1) and FLIPCHARTS (17.3) which enable people to share their thinking visually with each other in groups, or to access their own thinking if working solo with diagrams and images. In

an evaluation of a workplace (such as the ones where the final version of the lexis and syntax were tested) *Affordances* are assessed through semantic differentiation (Mehrabian & Russell 1974) between there being none of a particular affordance (scoring 0), to the environment being richly furnished with them (scoring 4). It is suggested that the richer the environment is in affordances, the more likely it is that those affordances (within the constraints of the interaction model of creative behaviour) will be used to positively enhance creative behaviours.

In *Affordances* we find the electronic devices that connect people with each other (ELECTRONIC (19)), the configurations of furniture that enable ENGAGEMENT or DISENGAGMENT (20) activities, the active engagement with visual affordances as detailed above (VISUALISATION (17)), passive engagement with information through a visual medium (VISUAL INFORMATION (18)), and affordances for orderliness such as areas of storage and issues of signage (ORDERLINESS (21)).

In total the meta-category of *Affordances* holds twenty-five units in five subcategories.

7.7 Creating patterns of meaning with the syntax and the lexis

Revisiting the syntactic structure set out earlier, it is now possible to fully populate the second half of the proposition: IF →THEN. Taking the example of:

> IF $(E_1 + P + IN)$ $(A_{in} + V_p)$
>
> **That is:** *Deliberate engagement with people and information through informal conversation and passive visual forms*

the second half, the THEN, becomes:

> →THEN (4) (4.2 *and/or* 4.3 *and/or* 4.4 *and/or* 4.5) (18) + (18.1 *and/or* 18.2 *and/or* 18.3 *and/or* 18.4) + (11.16 +13.3 + 14.5 + 16.1 + 16.3)
>
> **That is:** (Units of Place) + (Units of affordances) + (Units of properties)

The whole sentence reads as:

> IF what is wanted is deliberate engagement with people and information through informal conversation and passive visual forms, THEN create an attractor space which contains as many as possible of the following: coffee and tea-making or

vending, water cooler, photocopier and printer. In order to afford access to visual information, consider adding posters or wall displays/pin boards, information screens, shelves containing books and magazines, and possibly an organisational display case. Ensure that the space has properties that make it pleasant to be in: good air quality, good natural light, orderliness especially round any food preparation area, societal permission for the conversation and a feeling of aliveness in the space.

Taking the next sentence and completing it:

IF $(DE_1 + PR + C)(K_{pm})$

That is: Disengagement from the problem and the context/environment for a short time through physical movement (kinaesthetic)

there is a wider choice for the second half (the THEN). It can be exactly the same as the first proposition, with

→THEN (4) (4.2 *and/or* 4.3 *and/or* 4.4 *and/or* 4.5) + (18) (18.1 *and/or* 18.2 *and/or* 18.3 *and/or* 18.4) + (11.6 +13.3 + 14.5 + 16.1 + 16.3)

emphasising that what is needed is the *action* of walking to the space so described, and the person undertaking the activity may simply get a coffee and leave without engaging in any conversation or visual information. Alternatively it can be set out as:

→THEN (4) (4.6 *and/or* 4.7) + (15.1) + (11.5 +13.2 + 13.5 + 16.3)

The whole sentence might therefore read:

IF what is wanted is the possibility of disengaging from the problem and the context/environment for a short time through physical movement, THEN ensure that the temperature is cool enough for this activity to take place without discomfort, corridors and staircases are wide enough and pleasant enough to invite walking with a sense of spaciousness and distance to draw the eye and the feet. A changing colour scheme over the length of the corridor adds interest and orientation, and the walk should enhance the walker's sense of liveliness.

The IF of the syntax and the THEN of the lexis thus combine to create many different possible patterns for spaces that enhance their users' perception of creative support that is, the meaning that the workplace holds for them. Patterns, as stated above (page 204),

are created by the syntactic ordering of the lexical units in a 'sentence' written through the grammar of creative workplaces that results in the workplace users' increased perception of being supported in their creative behaviours. The patterns are also dependent on the users' creative footprints. The challenge is to create patterns that enhance the creativity of one user without inhibiting the creativity of other users. The lexis units set out in Tables 43-46 (pages 206-210) have been observed in different workplaces co-existing constructively and enabling a wide range of people to use them simultaneously and productively.

7.8   Poor grammaticality

The grammar can be used to assess an existing workplace for its ability to stimulate, sustain and support its users' creativity. In the prototype and final tests of the syntactic and lexical elements of the grammar, the outcomes included clear areas of potentiality, or areas where the syntactic creative behaviours were constrained by poor lexis. Patterns of physical press in the workplace can be hindering or even damaging to creative thinking. Lexical elements that score below two in the semantic differential scale run the risk of moving from a neutral position where the space neither helps nor hinders creativity, to a negative one where elements of creativity are actively hindered. This can happen, for example, where there are few if any affordances for encountering visual information because the building regulations forbid putting things on the walls (a common occurrence in buildings in the UK financed by Private Finance Initiatives (PFIs)). It has been observed in the case studies where there are no places for short unscheduled exchanges of information because the meeting rooms are all controlled by a central booking system, and where on a sensory level no thought appears to have been given to the positioning of noisy equipment such as photocopiers. Those working closest to them report finding the sound and distraction levels extremely high.

 Where key elements of the lexis are missing – for example where a meeting or work room has no windows hence no natural light (Respondent 10, Prototype Test 1, Final Test 2), or the furniture looks good but is uncomfortable (Case Study 1) or the temperature is consistently low and the air quality draughty (Case Study 3) – then the physical press's ability to stimulate, sustain and support its users' creativity is likely to be compromised. Where culturally permissable people will leave the work area, resulting in raised expenses levels and communication difficulties (R10); or if unable to leave, people may find their ability to think creatively is diminished (R1; R6). In terms

of this study, these are instances of poor grammar, where the meaning of optimal support for users' creativity is either not fulfilled or not communicated.

The potentiality is the gap between the existing unhelpful patterns of physical press and how those patterns might be changed to offer better support for users' creative behaviours and responses.   There are often alterations (small as well as large) to the existing patterns that can be made.   In Case Study 2 very small enhancements of workplace affordances were made after the research was done. These were: a dedicated cupboard for tea and coffee making equipment, signage that indicates which desks are available for hot-desking and for how long, and posters with photographs of all staff so that newcomers can put faces to names. Office staff subsequently reported (in a survey undertaken separately from this research study) an enhancement of their ability to perform well and think creatively.

7.9   Conclusions

This chapter proposes a grammar of creative workplaces which is both useful and important to architects and designers of workplaces, and to users of existing workplaces. In the grammar the syntax is made up of behaviours that lead to stimulation, sustaining and support of small-c workplace creativity; the lexis is composed of units of place, properties of that place and affordances within that place; and the meaning is the extent to which the workplace actively supports the creative footprints of all its users.

The grammar put forward is a generative one, predicated on the construction of IF →THEN, where IF is formed by the syntax and THEN is composed of lexical units, which then form patterns that have the intention of supporting creativity in the workplace. The possible combinations between the 120 units in the lexis, and the 33 different aspects of the engage/disengage creative behaviours that form the syntax call forward a wide range of possible patterns.

The grammar has been used to assess two existing workplaces for a) the degree to which they enhance the creativity of its staff (Chapter 6, Section 6.1 pages 181-183), and b) the shortfall in that enhancement and hence the potential for enrichment of the workplace.

The grammar can inform the design of a new layout or new-build workplace through the establishment at the outset of principles of design and the understanding of creativity footprints.   The grammar sets out the syntactic parameters for the activities that

stimulate and sustain creativity in the workplace, and contributes the lexical units that populate the syntax. The many possible permutations of the grammar between syntax and lexis, while working to a constant of meaning (the optimisation of creativity in the physical workplace) create a powerful approach to architectural, design, and management approaches to creativity in the workplace. The grammar, with its constituent parts of a three-part definition of physical press (lexis), the engage/disengage model of creative behaviour (syntax) and the concept of the creative footprint (meaning), is this study's primary contribution to knowledge.

This chapter has articulated the theoretical grammar; the final chapter draws conclusions about the practical use of the grammar and its significance in the workplace and in the core and cognate fields of research in which this study is founded. It also makes recommendations for designers and users of workplaces where small-c, everyday creativity is to be valued and encouraged.

Chapter 8: Conclusions

8.1 Introduction

This study has found that, with few exceptions, its respondents take their physical work surroundings as they find them and assume that change is neither possible nor permissible. Those who do question their physical surroundings, and they are found mainly among the Stage 1 interviewees who are either self-employed, senior management or working for companies with a relaxed attitude to staff, seek out the kinds of spaces that suit their particular behaviours. Those whose work environment is more physically and culturally restrictive grumble about aspects of the workplace that irritate them: "[The office is] practical and unpretentious - but not particularly inspiring. I loathe the embarrassing cheap Ikea framed pictures on the walls - why not our work? Or works by local photographers as on the stairs? Overflowing with piles of paper - very little storage, and we also house the agency soft drinks and biscuits which tend to sit in great heaps like a cash and carry" (CS1). Apart from removing themselves from the irritation physically: "Access to walks outside the building wins by a long shot [in helping creativity]. Walking away from and coming back to thinking [is] consistently cited in every creative thinking event or book I've ever come across" (CS1) or by shutting off: "[I put my] earphones in. [...] It's when I focus on what I'm doing" (CS1), they accept their physical lot. In questioning this viewpoint this research challenged employees' acceptance, and the Case Study 2 led to small but productive changes to their environment as a result of participating in the study (Appendix 7.2).

This thesis presents a grammar of creative workplaces. The previous chapters have been a journey of exploration through the research data and the literature, culminating in the emergence of a definition of physical press, the engage/disengage model of creative behaviours and the concept of the creative footprint. These three research outputs form the components of the grammar of creative workplaces. They have been explored and their contribution to the grammar described in Chapter 5.

This final chapter discusses how the grammar of creative workplaces might move beyond its academic context and be applied in the real and complex world of organisations. The chapter sets out what value the grammar might have in the context of organisations, and where it might sit within organisational strategy. It examines the

established need for the encouragement and application of creativity in its widest sense in commercial and other organisations, and how it might be implemented therein. Problems inherent in that implementation due to the economic climate at the time of writing, and continuing ambivalent organisational attitudes to creativity are also explored, and approaches suggested.

The grammar is intended to move from theory to practice. This final chapter, therefore, examines how the grammar of creative workplaces might move, and is moving, beyond its present theoretical position into beneficial practice for organisations and their people.

The research presented in this thesis has investigated the impact that the physical press (environment) of the workplace has on the everyday creativity (Richards 2010) of the people who work there. It has interrogated extensive data collected from professional practice, interviews, case studies, focus groups and tests. The data meta-categories, categories and subcategories emerging from this process have informed the definition of physical press, the engage/ disengage model of creative behaviours and the concept of the creative footprint. The research has found that these three key findings come together in a grammar of creative workplaces where the elements of physical press are the grammar's lexis, the engage/disengage model of creative behaviours is the grammar's syntax, and the concept of an individual or group's unique creative footprint is the meaning that is communicated through the ordering of the lexical units by the syntactic activities.

The constructivist grounded theory methodology used throughout the research process has impacted on the study in a variety of ways. The researcher's professional practice became an admitted part of the data in the study, setting a foundation for the engage/disengage model of creative behaviours which was then verified and extended by subsequent data. The nature of the constant comparator data analysis method allowed an iterative building of concepts and emergent theories between primary and secondary research. It encouraged the emergence of preliminary versions of concepts and theories that formed the foundations upon which the grammar of creative workplaces is built. Included in this process is the change of research focus from whether the physical environment does indeed impact people's creativity in the workplace (when research by McCoy and by Dul et al among others has indeed established the physical environment/creativity link), to whether it is possible to identify and codify those elements into a grammar.

8.1 Original contributions to knowledge

This thesis makes three contributions to scholarly knowledge. Firstly, it offers an interactive model of creative behaviour (Figure 4, page 49), proposing that the relationship between the physical environment and the creativity of its users is mediated by the perception of those users. The model contributes a significant approach to the link between creativity and physical environment, forestalling the 'ghost of physical determinism' (Franck 1984).

Secondly, the thesis proposes a generative visuospatial grammar, based on the syntactic structure of IF → THEN, that makes possible the design of new workplaces and the evaluation of existing workplaces in terms of their ability to optimise their users' creativity. This generative visuospatial grammar is syntax-semantic (that is, dependent on meaning as a key criteria of grammaticality) and thus creates a conceptual framework within which workplaces can be both designed and assessed for optimum user creativity.

Finally, sitting within this grammar are its three principal components or parts, each in and of itself an original contribution to knowledge. These are: a) the concept of the creative footprint, b) the definition of physical press and c) the concept of the engage/disengage model of creative behaviours, each of which contribute to and at the same time stand alone from the grammar.

The thesis also sets out how the original contribution to knowledge is used on the ground in workplaces, creating a robust framework which architects and designers can apply to their design of workplaces for optimum creativity. The framework of the grammar thus supplements and underpins previous best practice based on experience and intuition. At the same time the dissemination of the grammar (discussed below in Section 8.7 page 224) will go some way towards creating the conditions where it is no longer defendable to ignore or pay lip-service only to the issue of the physical workplace's impact upon creativity.

8.2 The way forward for the research through scholarly and practical applications

8.2.1 Why the research matters

This research is significant in its potential to make a positive impact on people's work-life through its application in two principal ways. The first is in the design and evaluation of work environments by architects and designers, and the engagement with those work environments by the people who work there. The second is the potential for increased levels of employee small-c creativity, where creative performance is enhanced by organisational support for individuals' and teams' creative footprints, and thus by employees' more positive mood (De Dreu et al 2008).

The researcher's professional practice involved visiting and working in client offices across public and private sectors. This was often an unpleasant experience, particularly in public sector buildings. While the public spaces of such buildings (tax offices and government buildings especially) were often spacious and light-filled, this did not necessarily extend into the working offices behind the facades. There a lack of direct natural light, uniformly brown or grey furniture and furnishings, poor artificial light and drably coloured walls and carpet created the creativity-dampening effects that inspired this doctoral research. While the people working in these spaces were not consciously aware of this effect, their responses in the professional practice creativity training sessions made it evident that they were affected by it. There are two questions raised by this: what might people who work in such environments do to become more consciously aware of them and their effects and make beneficial changes; and how might such environments be designed differently in the first place?

Looking first at workplace design, there are many examples of good practice in the design of workplaces for enhanced small-c creative performance. These are found often in the studios of companies such as Google, Lego and Disney where employees have a remit to produce middle-to-big C creative outputs (Groves 2010). These workplaces are designed from a basis of experience and intuition, and at times in response to client briefing but without a theoretical framework (Lewis & Moultrie 2005, Moultrie et al 2007). Evaluators of those workplaces discern commonalities between them such as spaces for creative behaviours like play and reflection (Groves 2010), commonalities that are also suggested by other researchers when examining workplaces in which non-

creatives work (Fayard & Weeks 2011; Dul et al 2011; Dul & Ceylan 2011). These commonalities are a mixture of physical and social press elements.

There has been, however, no robust theoretical underpinning for the design of the physical workplace for creativity, and it is this lack that this study has sought to redress through the development of the grammar of creative workplaces.

This research is significant in its potential to engage people more closely and beneficially with their workplaces. When asked about the impact that the physical environment has on their ability to be creative, respondents in this study were all able to articulate an opinion, and often a strong one. For example: "This [physical environment] is actually really damping down any creativity" R1 Health Service manager; "I managed to grab a few square feet [from the open-plan office] where we've some breakout tables for two to three people and a white board [for idea-generating]" R3 government middle manager; "[I need] space, light, calm. QUIET! [...] So space to reflect is useful" Case Study 1 survey response; "A creative space needs a place to work, but also a place to not work. A place to be productive but also a place to let go" Prototype Test 2 interviewee. Prior to being asked the question, the impact of the physical workplace on their creativity was something that few of the respondents had thought about. Instead respondents reported taking their physical environment for granted except when something actively impinged on them. Two examples of this are: the uncomfortable chairs that necessitated back treatment in Case Study 1, and windowless rooms making people want to work elsewhere in the organisation's building or outside of it as reported by the junior sales executive (R10), an engineer in Case Study 3, post-graduate students in Prototype Test 1, and an interviewee in Final Test 2. Only at this point of discomfort would respondents start to think about their environment from the point of view of making any changes (for example, asking to be moved to another room in the workplace that did have windows. The respondents with bad backs, however, did not request alternative chairs). Once the question was asked by the researcher, every respondent in the study knew and was able to articulate clearly what impact their workplace's physical press had upon their creativity.

It can be posited that people's awareness of the physical environment works at the level of their intelligent unconscious or under-mind (Claxton 1997) to survey for threats and opportunities (Gibson 1977; Stamps 111 2005; Fayard & Weeks 2007, 2011). For example, in Case Study 2 where small changes to the physical press were made in the

area of affordances (the introduction of a cupboard for storing coffee and tea-making supplies in the office, a poster showing the photographs and names of all the team, signs to indicate desk availability) increases occurred in staff perception of the degree to which their workplace supported their creativity and their overall work performance.

It could be argued that raising awareness of the impact of physical press on work performance, specifically workplace creativity, is enough to enable people to make changes. But awareness on its own is not enough; where respondents were aware of negative impacts of their physical press their reported responses were to disengage from it in whatever way was culturally permissible (from staring out of the window, to putting on headphones, to leaving the workplace altogether) or to simply put up with it and suffer whatever consequences arose in terms of reduced performance and raised stress levels (R1: Health Service Regional Manager).

This research is important because it can give people a simple mechanism which not only raises their awareness of the workplace's physical press upon them, but also provides the means to do something about any issues they identify. As it moves from a theoretical to a practical and commercial application (discussed later in this chapter) the grammar will give people a tool that they can use to evaluate their workplace and identify areas of potential creativity optimisation. The form of the grammar's commercial application, made simple and explicit for staff to monitor their own environment, enables and empowers staff to make changes that make a valuable difference.

This study, therefore, provides a comprehensive, research-based generative grammar that enables architects and designers to consistently design for optimal creative performance in the workplace. It also enables workplace employees to identify in their workplace areas that operate sub-optimally for creativity and understand what they might productively do about it. The interaction model of creative behaviour posits that once people become aware of the physical press's impact they can make choices and changes (Franck 1984) that make a beneficial difference to how they perceive their workplace, and hence how they work and behave within it.

8.6.4   An established need for creativity in the workplace

In every sector that formed part of this research, including manufacturing, engineering, public sector, new media and advertising, FMCG[26] and finance, senior managers and staff alike acknowledged the need for new ways of thinking about intractable or new problems. This is also reflected in the inclusion of creativity as a skill in case study staff assessments and declared objectives. Of particular interest to organisations is the capacity to tackle complex or *wicked* problems (Case Study 3 in particular). The introduction of Lean thinking (Womack et al 1990) into service as well as manufacturing companies (including using the Toyota Production System (Ohno 1988) in UK government departments) also drives a change in process and managerial approaches. The shifts in economic emphasis in the UK from manufacturing to service industries and recently back to manufacturing, persistently points up the need for employees to be able to think better and more creatively (Florida 2002). The economic recession has added further pressure on organisations from all sectors to do more with less resource, necessitating an increase in small-c creativity focused on process improvement as well as middle- to big-C creativity focused on product innovation.

8.6.5   Challenges in getting the grammar used in the real world

Despite the recognised need for an increase in employee creativity across the creative spectrum (Amabile 1983; Simonton 2005) there continue to be challenges in supporting and encouraging small-c creativity in organisations. These challenges arise from a variety of sources: architectural, commercial and cultural. In architecture, Philip outlined the difficulties of applying insights from architectural psychology into architecture where those insights were couched in what to architects seemed obscure and 'long-winded' (1996: 281) language, leading him to talk of the 'perceived uselessness of architectural psychological findings' (1996: 279) to architects. The commercial imperatives of financial return per square foot of floor space (Haner 2005) and the traditional view of facilities management as a business cost rather than a return (McDougall, Kelly, Hinks & Bitichi 2002) send some clients and architects down the road of maximising the use of space rather than maximising performance levels in the space.

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[26] Fast-moving consumer goods, particularly food production

Finally, a residual cultural misunderstanding of creativity as 'the romantic myth of "creative genius"' (Boden 2003: 254) rather than as 'draw[ing] crucially on our ordinary abilities' (Boden 2003: 245) can result in an organisation paying lip-service to supporting creative thinking through published objectives, while actively discouraging independent thinking in its teams (McCoy 2000). Support for creative thinking activities of engagement and disengagement must therefore come from the top levels of any organisation, and be translated into empowerment of the workforce (Foy 1980; 1994) to make changes in physical press and work process.

The greatest challenge to the use of the grammar in the 'real world' must therefore be that of visibility of the link between the physical environment and creative behaviours in it. Two of the three case study organisations in this research did not include a requirement that their workplaces be designed to enhance creativity in their briefs to designers and architects. Creativity was not mentioned for refurbishment of existing spaces in Case Study 1, despite the organisation's core product being creative advertising ideas; nor was it mentioned in the brief for Case Study 3's new building, although innovation is a core attribute in the employee appraisals. This lack of understanding by clients makes it difficult for architects, should they be aware of the impact of physical press on staff creativity, to introduce and enthuse about the issue. However, the interaction between physical press and people is becoming gradually more generally understood and acknowledged. Recent work from neuroscience on the brain's activity during creative thinking (Barrett & Barrett 2010) is contributing greatly to this process, as is its wider dissemination through such popularising work as Jonah Lehrer's *Imagine: How creativity works* (2012). The physical press/creativity link is reaching an organisational audience through articles in Harvard Business Review and The Financial Times (for example Fayard & Weeks 2010; Tett 2012) and a design audience through accessible architectural books that are short, visually stimulating and case study-based (Philip 1996) such those by Duffy (1997); Raymond & Cunliffe (1997); Groves (2010) and in Detail (2011). It is in this climate of increasing organisational awareness of both the benefits of applying a robust theoretical framework for the design of workplaces, and the disbenefits of not applying it, that the grammar of creative workplaces emerges.

Working with the grammar of creative workplaces in existing buildings is most likely to occur in one of three different circumstances. Firstly, when there is an internal organisational objective to increase creativity levels (as happened in Case Study 2); secondly where the imperative is part of a wider drive towards Lean Manufacturing or

similar programmes (as happened in the researcher's professional practice in the North of England thinking space designed "to help [the] engineers think better"), or lastly where the organisational space is undergoing a periodic refurbishment. Application of the grammar of creative workplaces is likely to happen in one of these three situations if and where the organisation is aware of the creativity/physical press link.

8.7 Future directions of the research

This is a practice-based thesis, founded in the researcher's years of professional practice and researched through the stages of interviews, case studies, focus groups and component testing. The iteration between practice and theory that has been explored through the previous chapters, culminating in the emergence of the grammar of creative workplaces, comes full circle from past to future professional practice.

There are four principal ways in which research into and with the grammar is being pursued. There are, additionally, two areas recommended for the future consideration of scholars.

Firstly, the grammar is being extended beyond its qualitative foundations. Work with the SPIRES research network (*Supporting People who Investigate Research Environments and Spaces)* is underway to build a quantitative database of findings from an extended application of the grammar, supplementing the existing qualitative data set and deepening and developing the grammar's foundations. SPIRES is a £200,000 EPSRC three year project. The researcher was brought into the project at the end of its first year to extend the network's research capability. The research work is using the grammar of creative workplaces to develop a database that can be interrogated for information on (among others) benchmarking for creativity support across workplaces and across sectors, optimisation of workplace design and configuration, and information about the individual-collaborative work balance and the extent to which it is reflected and supported–or not–in the layout of each workplace. Selected SPIRES members are using the grammar to assess workplaces (academic and commercial) that they encounter in their core research work. As the grammar is applied in different contexts, it is moving from theory to practice and extending and testing its legitimacy across a variety of research and other workplaces.

Secondly, the nature of the grammar's application is being expanded. The grammar's progression from theory to practice emerges from the needs of two groups: the

workplace's architects and designers, and its users. The grammar of creative workplaces' next stage lies in making it accessible at different levels appropriate to the two user groups. Working with the 4M architectural company, the grammar is being developed as a software application for commercial designers and architects. The first application that is currently being built will inform professional designers and architects as they design new-build offices and workplaces, or undertake extensive refurbishments of existing ones. This is taking the form of a software application for an iPad or similar hardware. The second software application is a hands-on *diagnose-and-alter* one for use by employees where they are empowered by their organisation (Foy 1980; 1994) or self-empower (McCoy 2000). This application will enable them to assess their workplace and make changes to it that are seen as beneficial in supporting their own and their colleagues' creativity and creative behaviours. This application is envisaged as both a simple iPad application and as a paper-based grammar similar to that used in this research's Final Test of components with an additional section on potential and recommendations. Both of these aspects of the grammar's application are being undertaken as collaborative post-Doctoral work. The output from these applications will, it is envisaged, feed into and develop the database.

A further application will explore the possibility of using the grammar to interrogate digital (CAD) drawings of workplaces (new-build and refurbishment) to extract and evaluate support for user creativity. The application will also identify areas of creative potential.

The third way in which the grammar is being used is in extending its application beyond organisational creativity. The generative structure of the grammar suggests adaptation to other cognitive activities. There is considerable interest and research currently being undertaken in the study of the optimum physical environment for learning spaces in school and university buildings (*Social learning spaces* (DEGW 2011)). The foundational IF → THEN structure lends itself to other content (as seen with the landscape grammar of Mayall & Hall). Many of the creative behaviours that form the syntax [IF] are identical in learning. The use of Auditory, Visual and Kinaesthetic criteria for engagement and disengagement is encountered in the field of learning sciences, as are the different categories of engagement and disengagement with people, information, ideas, the issue and the context. The researcher is contributing to the US *Learning Spaces Collaboratory* project which aims to enable "all 21st century undergraduates [to] have ready access to physical learning environments that enable

them to become engaged learners" (http://www.pkallsc.org/ 2012), bringing the grammar of creative workplaces to the thinking and resources of the project.

A fourth area for investigation, to be undertaken with the Centre for Geo-Information Studies, University of East London, is to interrogate the range of the grammar. Do the principles hold when the focus of the research widens from internal to external spaces? Does the grammar scale up to complex interiors, external neighbourhoods and to urban spaces? And what changes would have to be made to it to make this possible?

Finally two further directions are envisaged for future study of the grammar. The first is, as has been indicated in the thesis' Abstract, the proposal that in its hypothetical (generative) form the grammar could provide a foundation for testing the concrete influence of physical space on creativity. For example in one instance of the research that addresses this directly, Ward (1969), quoted by Amabile (1983/1996), examines the impact of environment on nursery school children. In his research a resources-rich room encouraged greater creativity than a barren experimental space. It is to be hoped that future scholars use the hypothetical grammar to examine the extent to which physical space positively impacts on creativity.

Secondly, it is envisaged that the grammar may have applications beyond the real and into the virtual world. The introduction to this thesis clarified the study's scope, positioning virtual work environments outside its remit. Some research has been done on virtual work environments where small-c creativity is required (Fayard & Weeks 2011) but much of the existing research examines middle- to big-C creativity environments specific to particular activities in and beyond organisations, for example virtual art exhibitions and events (Doyle 2011; Morie 2007).   Given the generative nature of the grammar, its application into building virtual world environments for creativity is a natural next step. Although people's needs and behaviours in virtual work environments are similar to those in real world settings there are significant differences in the affordances needed between them to build trust and promote engagement (Fayard & Weeks 2011) necessitating a return to first principles in applying the grammar in this environment. It is hoped that in the field of virtual worlds research future scholars and practitioners can use the grammar to examine the impact that virtual world space has on its users.

The principal ways forward for the grammar of creative workplaces and its different actual and potential application suggest a variety of complementary directions for future

research: into workplaces through architecture or through creativity and innovation management; into the SPIRES longitudinal study that captures and builds data into a quantitative database that can then be interrogated; into disciplines beyond creativity and innovation management, such as learning; into the larger scale of neighbourhoods and urban areas; and into an investigation using the hypothetical grammar to examine the extent to which physical space positively impacts on creativity.

The original contribution to knowledge made by the grammar of creative workplaces has the potential to make a practical difference to the working lives of people in all kinds of jobs. The link between creativity and positive mood, and between positive mood, creativity and wellbeing are well documented (Csikszentmihalyi 1988; Peterson 2006; De Dreu et al 2008; Anthes 2009; David 2009). Application of the grammar into workplaces of whatever kind, and across the sectors, has the potential to increase the positive mood, the creativity and the wellbeing of the people working there.

This study is offered as a contribution to scholarship, and in the hope that it will be of value to laypeople, architects and designers alike in improving the quality of their workplaces and hence the quality of their working lives.

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APPENDICES

Appendix 1: Analysis of five papers from Creativity & Innovation Management (Comparison of principles informing the design, management and evaluation of thinking spaces)

Principles informing design, management & evaluation of thinking spaces	Research papers: Authors & Research Subjects				
	Kristensen 2004 Pharmaceut-ical company (Europe)	**Haner 2005** Interactive Creativity Landscape (Germany) Learning Garden (Scandinavia)	**Lewis & Moultrie 2005** Royal Mail Innovation Lab.(RMIL) (UK) Future Focus Lab (DTI UK) University of East Anglia Staff Development Hub (UK)	**Moultrie et al 2007** RMIL (UK)	**Van der Lugt et al 2007** Shipyard Facility (Netherlands)
Divergent/convergent thinking (Osborn 19		✔			
4 stage creative pro (Wallas 1926)	✔	✔			
4 stage sub-processes (Kristensen 2004) • Value creation • Scaffolding • Imagination • Materialisation	✔				
Team: collaborative/ Communication	✔	✔	✔		✔
Individual/privacy	✔	✔			✔
Consultation with future users					✔
Moultrie et al (2007): Framework of strategic and operational context • Process of creation • Process of Use				✔	✔

4i's (Shipyard client vision) • inspiration • information • interaction • innovation • imagination					✔
Embodied creative processes • Value creation processes • Scaffolding • Imagination processes • Materialisation processes	✔				
Self-managed/ facilitated		✔	✔		✔
Hatch (1997) 3 levels: • Geographical • Building • Style		✔			
McCoy (2005) 1. Complexity of visual detail 2.View of natural environment 3. Use of natural materials 4. Fewer cool colours 5. Less mfr/ composite surface materials	✔ (some – not by name)				✔
Surprise / dislocation			✔	✔	
Lewis & Moultrie: • Structure/Infrastructure • Benefits/Dis-benefits			✔		
Supporting learning		✔	✔		✔

Appendix 2: Client presentation for Thinking Space design
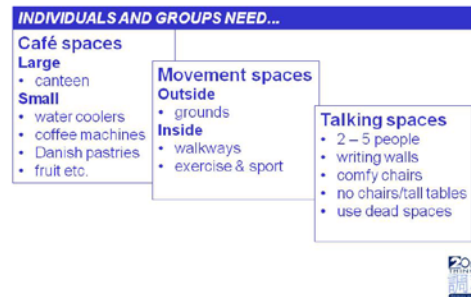
Appendix 3: Stage 1 Interviewee Profile

Each interviewee's work environment and individual creative process are given in the profiles below. In accordance with the consent forms signed by the research subjects, pseudonyms are used throughout these accounts.

Interview 1: Public sector (Health)

Andrea, aged 40-50, works in the UK National Health Service (NHS) as a Regional Manager. Her team of three supports innovation and improvements in the management of long term conditions (such as heart disease, diabetes, and respiratory conditions). Andrea works from two locations – a government office, and her own dedicated home office.   Andrea's creative process is an iterative one (Laseau 1986) in which she generates her own ideas, and then builds those ideas with others and with their contributions. During the interview she drew sketches of her own creative process and of an office in which she had worked where "To be honest [my creativity] stopped." The interview was conducted face-to-face in the interviewer's home office.

Interviewee 2: Public sector (Taxation)

Lucy (aged 40-50) is a Team Leader in a large UK government department of 80,000 staff. She manages a team of contact centre advisors who deal directly with UK taxpayers' queries, working in an open-plan office with tax advisors. Lucy's creativity is at the small-c end of the creative spectrum (Simonton 2005): "I get a lot of our ideas through observations throughout the workplace. We're an open-plan office, so you are seeing a lot of things going on, and you can just pick on something, or you can see something that's not particularly working, and it's just feeding off others' experience that I think that's where our ideas come from." Her creative process is group, and is strongly linked with organisational process: "We hold daily what we call 'Buzz Sessions' with our teams". The interview was conducted by telephone.

Interviewee 3: Public sector (Taxation)

Matthew (aged 40-50) works in a different area of the same UK government department as Lucy. As Programme Director he is leading a substantial national project, working from on open-pan office and other government offices, depending on his workload. Matthew's creative process is two-fold: solo thinking [...] normally on the train on the way home" and working with his teams collaboratively: "I think it's very rare that any

one of my ideas is anywhere near perfectly formed [...] but it can sometimes be the stimulus that can get people [...] thinking about it a slightly different way." The interview was conducted by telephone.

Interviewee 4: Private sector (Consultancy)

Henry (aged 30-40) is a senior consultant who until recently was working as a senior manager in a multi-national communications manufacturer. He now works with other self-employed colleagues and consults in organisational development and management development across a wide range of sectors. He works from his home office, and in his clients' offices and conference venues. Henry's creative process is an iterative one:

> "I could be developing an idea that's very much developing out of me, but then it interacts with somebody else [and] that starts to shift the development of the idea."

Henry has a variety of techniques that he uses to find and generate his ideas; he particularly uses the word *rummage* as in searching. He also uses metaphor and paradox, and is aware of the benefits of being quiet and still, what he calls "pausing". The interview was conducted face-to-face in the interviewee's home office.

Interviewee 5: Private sector (Finance)

George (aged 30-40) works as Head of Executive Development in a major financial institution, overseeing personal and management development for the organisation's top 300 executives. Although he shares an office, he uses it only "As a place to do computer work and to avoid phone calls from it at all times!" His thinking – solo and collaborative – happens "in rooms like this [the small meeting room in which the interview is taking place], and in breakout rooms which are like small version of this, basically central table, flip charts, paper and pens, post-its." His creative process has two main foci: how he assists with the generation of ideas for the organisation, and how he facilitates development in others. George also uses brainstorming techniques to enable idea-generating for customer products. The interview was conducted face-to-face in George's own workplace.

Interviewee 6: Not for Profit sector (Leadership)

Laura (aged 30-40) is the Deputy Chief Executive of a small NGO that focuses on the development of leadership within public sector senior management. She works in a variety of environments: the organisation's shared office, her home office, and from public spaces such as coffee shops. Her main work responsibility is to design and

manage leadership development projects with client organisations and individual clients. Laura sees her creativity as having two aspects:

> "Ideas [...] in two areas. One where I'm standing up doing my job [...] Also with my kids I find just … a whole new level of creativity and whole new way of thinking."

The interview was conducted face-to-face in the interviewer's home office.

Interviewee 7: Private sector (IT)

Watson (aged 50-60) is the Managing Director of an SME (Small to Medium-sized Enterprise) that designs and produces software products. He has founded and worked in a variety of companies: "I've found that I work best in a small group. I've tried everything from a big company to a solo." Watson sees his ideas as a co-creation with his staff.

> "So anyway, what do ideas come from? I think they come from everybody. [...] Somebody gives me an idea and I can build it."

Watson works both from his home office and from the company's shared office: "I do work at home at the moment, but only one day a week. Ideally it should be 2 or 3." The interview was conducted face-to-face in the interviewer's home office.

Interviewee 8: Not for Profit sector (Cultural)

Willie (aged 20-30) works within a large cultural venue (comprising a performance space, cinema, workshops, exhibition spaces, and cafe/restaurant) and as Centre Host has the responsibility of managing visits to the centre. Willie works in a long narrow open-plan office, at a desk next to the door and beside a display table. This position causes him some annoyance, as the door is kept locked from the outside to separate it from the general public, and he inevitably has to open it when colleagues haven't got their keys with them. Willie's main challenge is to organise his work onto computer files – an example of an idea that has worked for him is transferring school party data onto a spreadsheet so that it can be shared with the bus companies more easily and accurately. The interview was conducted face-to-face in the interviewee's workplace.

Interviewee 9: Private sector (Consultancy)

Robyn (aged 40-50) is an independent consultant working in enterprise development and software solutions, with both public and private sector clients. She both manages and initiates projects. A key part of Robyn's value to clients is an ability to range over a

wide variety of sectors and people, gathering and synthesising ideas. Robyn's creative process is one of continual searching, linking and synthesising:

> "And I'm constantly going: "Oh! Oh look, that's different!" So I'm looking for difference. And I never...there's probably never a moment in my life when I'm not looking for something."

Robyn works from her home, without a dedicated office space. She also works on the move, mentioning in particular the IOD (Institute of Directors) dining room, outside in the Rocky Mountains of Canada, and a particular airport lounge. The interview was conducted face-to-face in the interviewer's home office.

Interviewee 10: Private sector (Fast-Moving Consumer Goods (FMCG))

Jane (aged 20-30) is a National Account Executive in Sales with a multinational company. She has an iterative idea-generating process that she uses on her own and with colleagues. Jane is based in the company's Headquarters open-plan office, and uses it and HQ meeting rooms to work with colleagues; but she also cites pubs, restaurants, the local park and home as other places where she generates ideas either on her own or in collaboration with others. Jane made a drawing of her existing and her ideal office. The interview was conducted face-to-face in the interviewer's home office.

Interviewee 11: Private sector (Film & Media)

As a film director and writer Anna (aged 30-40) is the only interviewee who could be said to work at the middle-c to big-C end of the creative spectrum (Simonton 2006). Among other awards, she has won a BAFTA for one of her films. Anna works from her home in the countryside when she is writing, and in various locations when directing: "When I am reading the script that's at home. Then when you go into the office, that's when you are starting to work with the team." When directing, she talks about working in warehouses, the [production] office and the editing suite; whereas with writing she appreciates "being in the countryside, definitely, being able to go for walks. The interview was conducted face-to-face in the interviewer's home office.

Appendix 4:   Semi-structured interview process (Stage 1 Interviews)

The methodology for the research is Grounded Theory, therefore the first stage interviews are to be conducted with a minimum of questions. The initial question of all interviews is:

- "Tell me about how you get ideas at work…"

The following question set is included as a concurrent checklist. Based on a review of the creativity research literature, it prompts the researcher in identifying any areas that interviewees have not covered in their reflection/self-reporting, and poses follow-up questions where appropriate.

1. Using creative thinking at work

What do you think of as "creativity at work"?

    a.   When do you use or need it?

    b.   What for?

    Prompts: problem-solving, problem-finding, continuous improvement, lean, empowerment, sort out people issues, thinking beyond the rules. Other……..

2. Different stages in idea-generating

Preparation – getting the necessary information

Getting stuck – what do you do then?

Incubating the issue/problem/situation – how do you do this?

Insight: How do you get your ideas?

    a.   What are you doing when ideas come to you?

    b.   Are there different stages to you getting ideas?

    Prompts: Solo/with others

Verification: How do you check out/build on/develop your ideas?

3. Physical environment

What part does the physical environment play in you getting ideas?

    Prompts: Materials - visual sharing/white boards/smart boards etc

    Quiet/noise; Light/view/horizon

    Library/internet access/access to diverse stimuli, info, magazines etc

    Other…………

4. Social environment

What part does the social/work/company environment play in you getting ideas?

    Prompts: Permission/framework/expectations etc

Authenticity/values/management

Other…………

Appendix 5: Case Study 1 & 2 Electronic Survey Questions

1	**Research permission form**
2	**Workplace description**: • Which is the main space you work in? • Do you work in any other space inside or outside the building? If so, which is it? And what do you do there? • Tick any of the following places you do any of your thinking in (car, train, bus, aeroplane, none of these) • Which of all the spaces above (inside and outside the office) would you most like to work in, for the point of view of the space itself (rather than any status of job implications), and why? •

3	**Workspace characteristics**:
	• My part of the workspace has (0 – 4 where 4 is high)
	    • Good natural light
	    • A feeling of spaciousness
	    • A sense of the horizon outside, with a good view from the windows
	    • Extensive line-of-sight inside the space
	    • A busy atmosphere
	    • A feeling of calm
	    • Messiness (constructive)
	    • Messiness (unhelpful)
	Which of these characteristics most helps you think well and creatively? And why?

4	**Workplace facilities**:
	• In my part of the workspace I can (0 – 4 where 4 is high)
	    o Make a coffee or tea
	    o Get a drink from a dispenser or water cooler
	• In my part of the workplace there is (0 – 4 where 4 is high)
	    o Enough space to move about freely
	    o Access to walks inside or outside the building
	• In my part of the workplace there is/are (0 – 4 where 4 is high)
	    o Equipment for group visual thinking (eg whiteboards, writing walls, pin-boards etc)
	    o Interesting professional literature
	    o Enough space for short spontaneous conversation (no booking)
	    o Enough space for larger informal conversations
	    o Easy access to the people I need to talk to
	• In my part of the workplace there is/are (0 – 4 where 4 is high)
	    o Literature from other industries for browsing
	    o Unrelated work on show
	    o Opportunities for chance conversations with people from other departments
	    o Opportunities for chance conversations with external people

	- Which of the activities and spaces in this section are most helpful to your own good and creative thinking? - Which of the activities and spaces in this section are least helpful to your own good and creative thinking?
5	**Workspace perception** - In my part of the workspace I feel that (0 – 4 where 4 is high) - It is all right to experiment and take risks - The physical environment actively supports my creativity - My ideas are helped by the environment and what is in it - I can change my immediate environment if I want to, to suit my preferences and needs - My overall perception of the workspace is...

Appendix 6: Case Study 3 Electronic Survey Questions

1	**Research permission form**
2	**Getting ideas at work** When you have a problem to solve, how do you go about it? How do you start off your thinking, then continue to work on the problem and finally reach a solution? (Eg: working on your own, with others, gathering information, making mind maps or other diagrams, etc.) When tackling work problems, which of the stages do you tackle alone and which with others? Problem start/problem middle/problem end • On your own • With others face to face • With others remotely A mix of the above
3	**Physical spaces for idea-generating** To work in the above ways (solo, face to face with others, remotely with others, a mix) what kind of physical environment do you need? (Please tick all that apply.) • Single office • Shared office • Informal meeting room • Formal meeting room • Chance meetings in the corridors or canteen • On the site outside • Outside the workplace • Other or outside the workplace (please specify) What is it about the spaces above that is important to you in generating ideas? • Being able to see out of a window • Natural light • A feeling of spaciousness • Ability to control the temperature • Quiet and calm • Lack of interruptions Having the privacy for concentration • Good 'buzz' and busy atmosphere • Being able to move about in my own space • Being within walking distance of everyone I need to talk to • Being able to leave my space and move about the building easily • Other (please specify) Which of the above are most important to you, and why? I have to tackle problems and issues in areas of the site (inside and outside) where I have little or no control or choice over where I am (e.g. transformer room, control room etc) • Yes • No

	If you have answered YES to question 4, what is it about the space (please specify which space it is) that HELPS your thinking? If you have answered YES to question 4, what is it about the space (please specify which space it is) that HINDERS your thinking? I have access to what I need to enable me to: (please tick all that apply) Think visually on my own and with other people (whiteboards and other drawing aids) - Find information easily - Get a coffee or a drink of water - Have easy access to colleagues when I need it - Have an informal meeting for 3 or more people (outside my normal workspace) - Bump into colleagues by chance - Come across interesting information by chance Other (please specify)
4	**Workplace perception:** In my part of the workplace I feel that (1 = not at all; 4 = very much) - It is all right to experiment - The physical environment actively supports idea-generating - My ideas are helped by the environment and what is in it - I can make changes to my immediate environment if I want, to suit my preferences - Other (please specify) Changes that I would want to make to my workspace, so it supports my thinking better.

Appendix 7: Case Study 1

Case Study 1: Media Communications

Case Study 1 was conducted in Media Communications (all names are pseudonymous), a private sector advertising company that is an independent subsidiary of a UK holding company. It is housed in a rebuilt 18th century docklands five-storey building. Media occupy the top four floors and have a ground floor level entry over a restaurant and an internal corridor to a private car park at the rear.

This case study was conducted over the course of two weeks: in the first week the researcher and the research topic were introduced to all staff by email, interviews conducted with two senior staff (Creative Partner and Client Services Director) to establish the company position on creativity, and an electronic *creative environment survey* was distributed to and completed by staff. The researcher then spent a week on site, observing on each floor, interviewing a further senior staff member (Personnel Manager), collecting relevant company documentation and conducting seven staff interviews. Reflexive notes were made throughout on the researcher's state (emotional, mental, physical), possible resultant researcher bias, and also on how the researcher's presence might influence the behaviours observed.

Clarification of terms

Creatives refers to those staff who work within the creative department i.e. whose core job is to have and develop ideas for the advertisements or direct marketing products that are the company's output. *Non-creatives* refers to all other staff, mostly in a supporting role.

Company background

Media Communications was formed from an amalgamation of two advertising agencies: The Agency, an 'above-the-line' agency (i.e. traditional advertising – bill boards and posters, television, etc) who had sole occupancy of the building until the merger, and The Ship, a 'below-the-line' agency (i.e. direct marketing – leaflets etc) that moved into the building to join its new partner. The Ship's previous building still houses the IT and the main part of Finance, and is not part of the case study. There is very little overlap between the two companies on commercial product. This separation carries over into working practices, with The Agency emphasising internal competition where different creative teams (a team comprises a copywriter and an art director) compete for the same

brief. The Ship emphasises collaboration, with teams formed for specific jobs, then disbanded and reformed for subsequent ones. There were considerable issues around the amalgamation, not least of which was the company name, with The Agency continuing to use its old name, and The Ship using Media, the amalgamated company name. This ambiguity was reflected physically in the layout with a double reception desk at which the visitor was asked which company they were here to see, and in the physical separation of staff in the creative and account management departments. It was also borne out in the interviews with interviewee staff from The Agency consistently referring to The Ship by the amalgamated name of Media, with the implication that their own company name remained the old one. The website introduced a further name (The Shore) which reflected the location of the company building and was occasionally used by staff. The researcher, in seeking to stay neutral in this dynamic, often used this name.

Company position on creativity

Because Media's product is creative advertising it was particularly important in this case study to ascertain the company perspective on small-c and big-C creativity. This research focuses on the small-c end of the creativity continuum (Simonton 2005; Amabile 1996) which enhances everyday life and work primarily through problem-solving, and many of the company employees are working at the middle- to big-C end of the spectrum, so the findings needed to be viewed against each perspective. The areas explored were: what the company understands as 'creative'; how far the company differentiates between big-C and small-c creativity; and how these perspectives affect how the company treats their big-C staff as against their small-c staff. The company position on creativity was derived from interviews with three senior managers (Personnel Manager, Creative Partner, and Client Services Director) and from the company appraisal documents.

Senior staff see creativity in Media as "very much a collective process", "a multi-headed beast". They see this in terms particularly of the relationship between 'creatives' (art directors and copywriters) and account managers. At the same time, they also recognise the contribution made by all the other departments in the company. "There is a huge amount of creativity that isn't seen necessarily as core" refers mainly to the account handlers, but also to "everybody" in the company. There is a clear differentiation made between core and non-core creativity, or as it is also referred to: specific and general creativity. Core or specific creativity is the work done by the

creatives for clients ("What we are in business for"), and the account handlers' briefing that inspires it ("Finding the nuggets").

In the company documentation creativity is a specific criteria in the account managers' and planners'[27] self-appraisal forms ('Writes inspiring creative briefs'; 'Can tell the difference between a good idea and a bad idea'; 'Makes a strong contribution to the creative output'; 'Demonstrates passion for Agency's creative work'). The creatives are judged by the quality of their work on a project by project basis rather than on a formal appraisal sheet. In the appraisal forms for staff in IT, Finance, Print, Traffic (job processing and logistics) and Studio (making print-ready artwork on the computer from creatives' drawings) non-core or general creativity is recognised under the heading Attitude/Planning. The criteria include the "attitude" that staff bring to their work and how positive, constructive, and "can do" that attitude is; how flexible and collaborative they are; and how fast they "catch on". These are behaviours and attitudes demonstrated in small-c problem-solving creativity (Simonton, 2005). The equivalent criteria in other departments are knowledge and to skills, and staff willingness to extend those skills through development, and to colleagues: Traffic, for example, should be 'Seen as first port of call when there is a problem'.

Senior staff said "generally the company sees most people who work within it as being relatively creative". A key part of the general (non-core) creativity in the company is the supporting role "necessary to get work done in a commercial context," of Finance, IT, Planning (background research), Traffic, Print Production, and Studio artwork. The collective nature of creativity in the business process was seen as "synchronisation: it's efficiency, it's quicker decision-making, it's reaching a common goal at a specified time and date – wow!" and "The efficiency is vital – it's a joy!" Detail such as the need that staff should be "creative with timings and budgets" was seen in the context of making "a little bit of money go a long way" through collaboration with other companies or colleagues; and in coping with the tight timescales imposed by the clients.
Senior management's view that there are two kinds of interdependent staff creativity, specific (core) and general (non-core) is held throughout the company, with staff across the departments recognising their own level of creativity. This clarity means that it is possible to measure the research findings against small-c creativity (non-core, or general) as practiced by support staff, distinguishing it from the big-C creativity (core,

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[27] Planning conduct underpinning research: "The science of creativity", "the intelligence-gathering", "the facts and figures and data" that backs up and informs the creatives' output.

or specific) practiced by (for part of their job) the account managers and planners, and (for all of their job) by the creatives in the creative department.

Company position on the creativity and physical space link

Two years prior to the case study the company employed an interior designer to carry out the refurbishment of the second floor, where the creatives work. The aim was to make space for more people to work there by creating an open plan office in place of individual offices. The designer in a telephone interview, and the Personnel Manager face-to-face, were asked about the briefing process. "Initially the 2nd floor had individual offices [...] At least two didn't have any windows. Then it got to the stage that there wasn't enough room; but also [the Creative Partner] had this idea that he quite liked the idea of open plan" (Personnel Manager). The brief originated with the Creative Partner who "wanted the creatives to communicate and collaborate – everyone working together, and get the competitive element going by people seeing what each other are doing. [Teams] working among other teams working" (Designer). The work was commissioned and overseen by the Personnel Manager: "[I] said that the brief was that there are these number of people and we want the walls knocked down." At no point in the brief was the impact of the space on creativity considered. When asked about whether there was a detailed brief the designer said: "No, only a verbal briefing and a shopping list. [...] The emphasis [from the Personnel Manager] was on space planning, bums on seats and making it open plan. [...] Very budget-conscious." Although the creatives themselves were consulted, much of their input was ignored: "Some of the suggestions – the easy ones – were actioned. Others were too personal – they were ignored and people told 'get over it'" (Designer). The link between physical space and creativity was recognised by the Creative Partner in terms of the iterative creative process ("communicate and collaborate – everyone working together") but not by either the Personnel Manager or the designer.

Building layout

The first and second floors are identical in plan, with some small non-structural differences. There is a narrower right hand extension on the third and fourth floors (indicated in the figure below by the shaded area) but other than that, each floor is

identical with two toilets and a small kitchen area in identical positions.
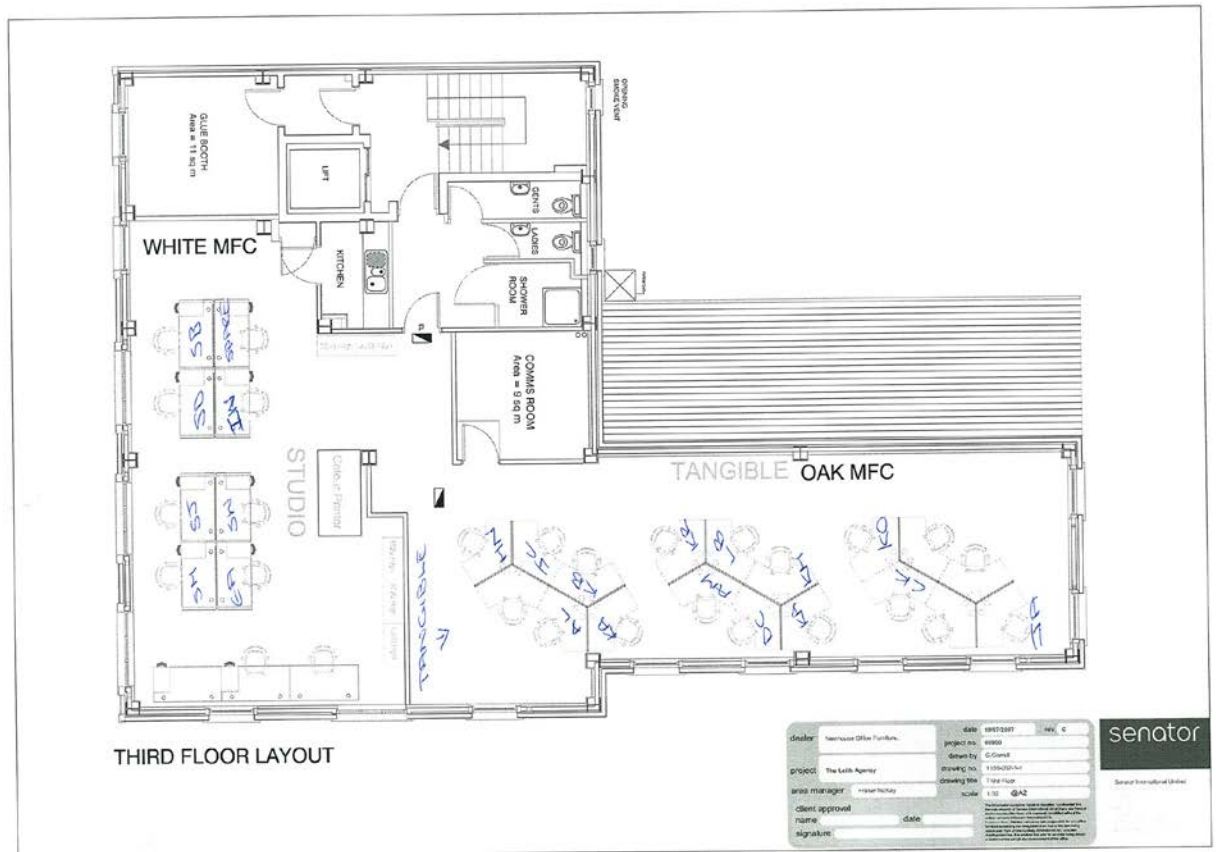
Third floor plan showing layout and narrowed west extension

The windows on the left and the bottom of the drawing have views over the docklands. The windows at the right of the drawing look out onto the wall of the neighbouring building, and those at the top of the drawing look out over the car park and its high brick walls. The position of desks and the light and view they afford is very important to staff. There is a mix of spaces on each floor (see figure below).

Spaces	First Floor	Second Floor	Third Floor	Fourth Floor
Open plan areas	Finance Production Account management	Creative Partners Creative department Media creative department (+ 'the nursery')	Media account managers Studio	Planning (sister company)
Small single-person office	Personnel Managing Director			Sister company Managing Director
Large meeting room				Board room
Small meeting room	One	One		
Middle-sized meeting room				Presentation room
Discussion area		Red sofas		Three sofa cluster
Other	Reception + seating area with 2 chairs and small table	Television 3-person office	Server & comms. Hardware room Store room (ex-shower room) Glue-spraying room (Studio)	
Informal areas made by staff	Arm chair		Small round table with 2 chairs	

Space allocation within the Media building

Despite a reported shortage of meeting rooms it was noticeable that staff had created only two informal areas, both in the Account Management departments of the respective halves of the company. The creatives were often away from the building, using local coffee shops and hotels for meetings; for example, the researcher's interview with the Creative Partner was interrupted because of a double-booked meeting room, and was finished in the lounge of the local hotel. Account managers, on the other hand, stay in the office: "Generally speaking [I] don't want to be out of the office. Maybe if you are an account director, [but I] don't feel comfortable [taking] time away from my desk, albeit I am briefing somebody. Got one particular client who wants me at my desk all the time, he is phoning me all the time."

Research process

The researcher's time on site was divided between observation and interviews. At all times the observations were supplemented by reflexive notes. Staff were consistently

welcoming and curious about the research, and happy to be interviewed when asked. The response rate on the survey was 52 responses out of 105 staff in the docklands building. Staff in the other building were not surveyed.

	Research Activities			
	Morning observations	**Afternoon observations**	**Interviews**	**Other**
Previous week			Client Services Director	Introduction to Managing Director Gather company documentation Introductory email and electronic survey sent out to all staff
Monday	4th Floor observation		Creative Partner	Introduction to Personnel Manager
Tuesday	3rd Floor observation	1st Floor observation	Planning	
Wednesday	2nd floor observation	Off-site	Account manager Studio	
Thursday	2nd floor observation	3rd floor detail checking	Finance Creative Designer (by telephone)	Early morning observations before staff arrive
Friday	1st floor detail checking		Creative Creative	
Following week			Personnel Manager (by telephone)	

Research activities and respondents in Case Study 1

All interviews were recorded and transcribed in full. Excluding the interview with the designer, four interviews were held with creatives (core creativity), the other six with non-creatives, of whom three were expected to show some core creativity (as evidenced in their annual assessment sheets). Interviewees were chosen to give a spread of core, non-core and mixed creativity. They were also chosen to reflect different hierarchical levels.

Role	Hierarchical level			Core creativity	Non-core creativity	Mix of core and non-core creativity
	Senior	Middle	Junior			
Client Services Director	✓					✓
Creative Partner	✓			✓		
Planning			✓			✓
Account manager			✓			✓
Studio			✓		✓	
Finance		✓			✓	
Creative			✓	✓		
Creative		✓		✓		
Creative		✓		✓		
Personnel Manager		✓			✓	

Interviewees' role, status and creativity type

Observations were conducted from a variety of positions on each floor, governed by the researcher's need to see as much of the space as possible (a long line-of-sight), and by the company's need for unimpeded work in a crowded space. Each observation position (a large pencilled dot) and its isovist[28] (yellow outlines) were charted on A3 floor plans, along with colour coded lines charting movements within the space (as seen in the figure below).

The observation noted the different intentions of movement, triangulating the data with that collected in the interviews and surveys. The red lines indicate people coming in from other floors or leaving theirs, the blue lines are internal movement across the floor from a person's home desk, indicated by a blue dot. The dark green lines indicate short internal movement for breaks to toilet or kitchen area, and the light green indicates when that person was holding a mug or water glass. The orange crosses indicate a chance or standing conversation with someone else en route, short, or to leave the building for a smoke or lunch break.

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[28] The volume of space that can be seen from a specified point in a location.

FOURTH FLOOR

LETHAL THINKING

PLANNING

OLD BOARD RM

SMALL MEET ROOM

KITCHEN

GENTS

LADIES

LIFT

LIFT MOTOR ROOM
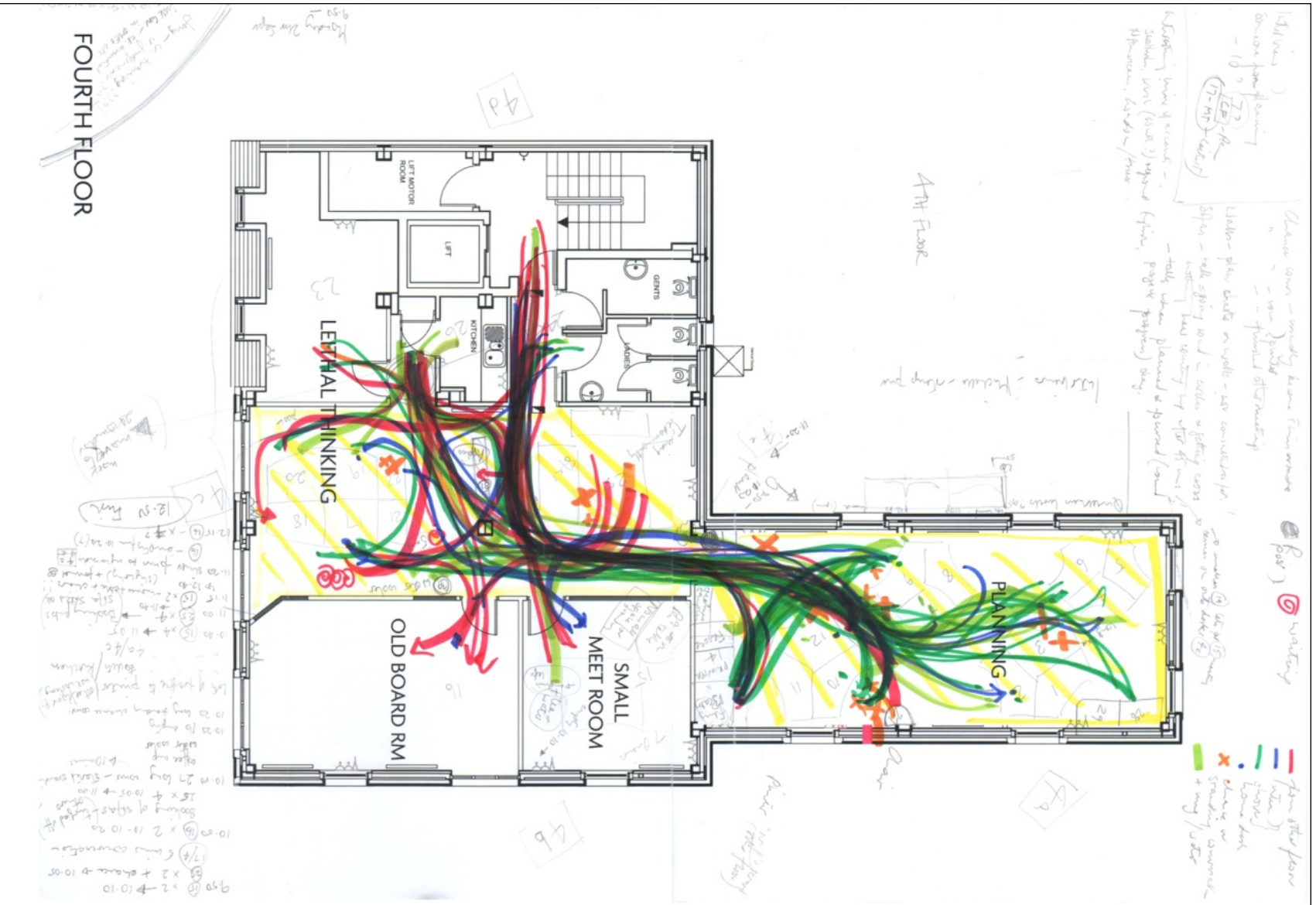
Appendix 7.1: Case Study 2: Improvement Support Team, Scottish Government

Case Study 2 was undertaken with an Improvement Support Team (IST) of the Scottish Government supporting the delivery of policy and key performance priorities and targets through five internal sub-teams focusing on different aspects of service delivery.

When approached to be part of the research project the IST was already planning to make changes to their physical workplace environment with the aim of enhancing staff's ability to be creative and innovative in their work. A condition of the research was that the researcher should also undertake to support staff who were leading the changes. The outcome of this support is presented in the following Appendix 7.2.

The team comprises 65 people, of whom 29 work exclusively in the IST open-plan office in St Andrew's House (SAH), a key Scottish Government Edinburgh building. The other 36 work remotely from their homes, hot-desking in SAH or coming in for meetings. Everyone on the team, therefore, works in the SAH office either as a 'permanent' or a 'hot-desk'. At the time of the case study there were 3 vacancies in SAH, and 4 vacancies in remote working. The office is on the 2nd floor of the building; the IST workspace occupies one half (split lengthways) of the wing of a floor; the other half of the office is occupied by a separate team who work in collaboration with IST. There are windows along both sides of the floor, affording good natural light and spectacular views on the southern, IST side of the office. There is good desk space, approximately 4ft x 30 inches per person.

The research in CS2 was carried out exclusively using an electronic *creative environment survey*. The survey was conducted with the following aims: to collect staff perceptions of their workplace environment, to assess from this data the extent to which existing core and sub-categories were deepened and added to, to correlate the emerging findings with the existing interim findings seeking areas of validation and difference, and finally to set in place the foundations for a pilot test of those interim findings.

The creative environment survey used is the same as that used in Case Study 1 with changes only in its layout to reflect the different building, not its content. Thirty-six percent of survey respondents were the SAH 'permanents' who worked exclusively in SAH, while sixty-four percent of the respondents were remote workers. The survey

results are therefore weighted, by number, in favour of remote workers and the results are interpreted taking this into account. The creative environment survey was conducted to discover staff responses to the working environment in SAH and the degree to which they felt it actively supported their creativity in work. It also measured the extent to which staff perceived that elements of physical press (place, characteristics and affordances) were present in SAH, and how these supported or not staff ability to exhibit creative behaviour as defined in the interim version of the engage/disengage model of creative activities (risk-taking, chance conversations, visual thinking techniques, moving within and outside the office and so forth). Other measurement criteria, requested by the IST management as a condition of the case study, are set out in the table below.

	My Work: Individual performance criteria	Our work: The small team performance criteria	Departmental work: The whole IST team performance criteria
Individual work	Concentrate Think clearly Think creatively and innovatively		
Departmental work	Produce high quality work	Overall high quality work	Meeting targets
Shared work within the team	Develop and sustain good connections with colleagues	Communication within the team Collaboration within the team	
Shared work within the department		Connection with colleagues inside and outside the immediate department	Communicating with people from outside the team
Shared work outside the team			Collaborating with people from outside the team
Cross-team requirement	Maintain a good level of physical comfort and health		

Measurement criteria for IST feedback

Organisational understanding of creativity

IST management were clear that all the creativity used within the team was small-c creativity. Because there was no expectation or requirement for big-C creativity in IST, there is no need to differentiate, as in CS1, between small-c and big-C creativity.

Appendix 7.2: IST Report issued after parallel research intervention

IST Workplace Environment Changes:
Report

Alison Williams
October 2010

BACKGROUND

The Improvement Support Team (IST) in the Scottish Government (Department of Health) planned to make changes to their physical workplace environment with the aim of enhancing staff's ability to be creative and innovative in their work. They kindly agreed to be a case study for Alison Williams' PhD study of "the impact that physical space has on people's ability to be creative at work".

EXECUTIVE SUMMARY

The research took the form of two electronic surveys conducted either side of an intervention by the researcher, and workplace changes made by the Workplace Improvement Project team. The surveys measured the extent to which staff felt that the physical office environment in St Andrew's House (SAH) and in their remote working bases actively supported agreed performance measures for the individual, the team and the department. The individual section measured perceived impact of physical environment on staff's ability to concentrate, to think clearly and innovatively, to produce high quality work, and to develop and sustain good connections with colleagues and a good level of personal physical comfort and health. The team section measured impact of physical environment on staff's perceived ability to communicate and collaborate within the team, to connect with colleagues and to produce high quality work. The departmental section focused on IST's overall performance and relationships within the Scottish government and beyond, looking at the impact of physical environment on staff's ability to communicate and collaborate with people outside the immediate team, and the team's ability to meet its targets.

In each of the three areas of measurement the survey returns showed that IST staff perceived that their working environment in St Andrew's House, after the intervention and changes made, had an increased beneficial impact in supporting performance. The percentage of low scores (gives *very little* or *little* support) decreased, and the percentage of high scores (supports *well* or *substantially*) increased.

In the remote working environments, however, the percentage results were unchanged or very slightly lower, in each area of measurement. The remote working environment serves here as a control group.

It is therefore possible to posit that the changes made within the SAH office have had a beneficial impact on how people work, and on the extent to which they feel the physical environment supports their ability to think innovatively and to perform well.

RESEARCH METHOD

The research was conducted primarily through electronic survey, with one direct feedback session to all staff. An initial survey measured staff perceptions on the extent to which their current St Andrew's House (SAH) office and/or remote working spaces actively supported their ability to perform against criteria agreed by with the team manager.

An intervention was then carried out: firstly a creative environment survey was conducted with the aim of raising staff awareness of the space in which they work and how that space might impact their creativity. The results of the creative environment survey were then fed back to all staff (those staff unable to attend the feedback session received the presentation slides by internal email). Following this a departmental working group, in consultation with staff, identified and implemented changes to the workspace that aimed to increase performance, especially creativity and innovation. The measurement survey was then repeated after an interval of several months to minimize the possibility of a Hawthorne[29] effect.

The measurement surveys were conducted in September 2009 and in May/June 2010. The intervention took the form of a *creative environment survey* in September/October 2009 and feedback of the results on the 14th October 2009. Subsequent changes to the workplace were made early in 2010. These changes were:
- Welcome and induction for new staff revised
- Addition of nameplates on desks to ensure staff are readily identifiable
- Available workspace more readily identifiable through clear seating plans, out of office signs and a "who's who" up on a central notice board
- Improvement of the environment by cleaning carpets and a black bag day to remove unnecessary items

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[29] The **Hawthorne effect,** called after the company in which the original research was carried out, states that people being studied improve or modify the aspect of their behavior being observed simply in response to the fact that they are being studied, not in response to the changes that are being studied. In order to avoid the possibility of such an effect it is advisable to wait until changes have embedded before measurement.

- Team pods achieved by making a few moves
- Tea and coffee-making cupboard organised for all the team.

Changes such as colour change to walls, reorganising of the office and new furniture were ruled out on the basis of cost.

The performance criteria were divided into those appropriate for work by an individual, a team, and the IST as a whole called, respectively, 'my work', 'our work', and 'departmental work'. Both the measurement and the creative environment surveys were designed to include responses to statements on a scale of five, with some open replies. The responses were measured in two ways: pre-intervention measured against post-intervention, and St Andrew's House (SAH) against remote working. This last forms a control group.

The first survey had 42 respondents, of whom 35 finished the survey, and 9 had no remote working base. The second survey had 21 respondents, all of whom finished the survey, and 8 of whom had no remote working base. The results below have been given in percentages so that the surveys can be compared. It is possible that the people responding to the second survey are those who feel more strongly about their place of work, and so all areas where there is only a negligible difference between the first and second survey have been marked as the same.

RESEARCH FINDINGS

'My work'

The individual performance criteria measured in this survey were the ability to:

1. Concentrate
2. Think clearly
3. Think innovatively
4. Produce high quality work
5. Develop and sustain good connections with colleagues
6. Maintain a good level of physical comfort and health

In SAH the results were, with the exception of (5), higher post-intervention. In all except (5[30]) the 'very little' and 'a little' responses were reduced by between 3% and 20%. The amalgamated results for 'well' and 'substantially' rose by 8.7% for *Concentrate* and *Think clearly*, by 5.1% for *think innovatively*, by 5.5% for *Physical comfort and health* and by 18.6% for *Produce high quality work.*

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[30] Although the overall result for (5) in SAH was lower in the post-intervention, the differences are small: between the first and second surveys the difference in the amalgamation of 'very little' and 'a little' was 2.3%; between the amalgamation of the other three measures ('adequately', 'well', 'substantially') the overall difference was 1.5%.

By contrast, results in remote working were (again with the exception of (5[31])) almost unchanged. In all except (5) the 'very little' and 'a little' were reduced by between 3.5% and 18.7%. In remote working staff said that their ability to develop and sustain good connections with colleagues was enhanced: this may be a result of specific changes made in SAH by the improvement team.

'Our work'

The small team performance criteria measured in this survey were:
1. Communication within the team
2. Collaboration within the team
3. Overall high quality work
4. Connection with colleagues inside and outside the immediate department

In SAH the results were uniformly higher post-intervention with particular enhancement for (1) and (3). Here the reporting at the 'well' and 'substantially' levels went from 25.8% to 45% for internal team communication and from 20% to 50% for overall high quality work.

The remote working, by comparison, stayed at the same levels as pre-intervention, with the exception of *High quality work* (3) where the 'very little' and 'a little' levels reduced by 17.1% and the levels in 'well' and 'substantially' rose by 13.5%. It is not possible to attribute this improvement to any one variable, but it is possible to posit that the increase in this area within SAH in some way impacted perceptions in remote working.

'Departmental work'

The whole IST team performance criteria measured in this survey were:
1. Meeting targets
2. Communicating with people from outside the team
3. Collaborating with people from outside the team

In SAH the results were only slightly higher post-intervention: meeting targets as measured at the 'well' and 'substantially' levels was enhanced by 10.7%, communicating with people from outside the IST team was unchanged, and collaborating with such people was enhanced by only 5.5%. Remote working performance measured against these criteria was uniformly, if slightly, lower: the 'well' and 'substantially' levels for meeting targets down by 3%, levels for communication down by 6.6% and levels for collaboration down slightly by 1.7%. The levels of 'very little' and 'a little' did, however, reduce for all three criteria.

The 'open replies' in the survey where staff wrote longer responses to questions, continue, both before and after the intervention, to point up the issue of distraction

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[31] In remote working the results in (5) post-intervention improved, with a drop of 19.5% in the 'very little' and 'a little', and an increase of 10.3% in the amalgamation of the other three measures ('adequately', 'well', 'substantially').

through noise in the SAH office. This issue also arose in the intervention survey, and was the subject of discussion in the feedback session.   One post-intervention survey respondent particularly mentioned the beneficial impact of the laminated availability cards on the desks.

CONCLUSIONS

The time lapse between carrying out the improvements and conducting the second survey has ensured that a Hawthorne effect has been avoided, and the remote working reports have served as a control group to further strengthen the findings.

While little impact has been found on the IST team taken as a whole in their SAH office, individuals and smaller internal teams report that they have clearly benefited from the workplace changes made to the SAH office environment. The specific aim of impacting innovative approaches in IST has been achieved by a 5.1% increase in the ability of the environment to support innovation 'well' and 'substantially'. An extra benefit has been the perceived impact on people's ability to produce high quality work in the SAH office. This has risen by 18.7% for individuals, and by 30% in small team work: a considerable increase.

The work that the Workplace Improvement Project team carried out in the SAH office has, therefore, had a measureable and significant impact on staff perception of how the environment supports their ability to do good work against a wide variety of criteria. The results have more than justified the time and effort of the Workplace Environment Project team.

Appendix 7.3:   Case Study 3: Multinational Engineering Company (MEC)

The multinational engineering company who agreed to be part of the study did so on condition that its anonymity was preserved. The company will therefore be referred to throughout as MEC and an overview of the company can be only general.   The agreement included a prohibition on publishing any floor plans of the building, so the building will be described verbally and any details that might make it recognisable have been removed.   There are 80,000 employees world-wide; at any one time there are approximately 170 MEC employees, approximately 60 contractors and approximately 20 trainees (figures supplied by the personnel department) on this site. Most of these are either working on or supporting the engineering plant on site. There are approximately three MEC employees who are based at this site, but who work with distributed teams (Edwards & Al-Ani 2008) across the world in Asia Pacific, North America and Europe, using various software programmes to conduct their business.

Building Overview

The MEC site studied is a three-storey building designed by BDP (Building Design Partners), built in the 1980s, and with a large engineering plant behind it.   On the ground floor of the building, in the words of the architect's summary, "offices, conference rooms and a restaurant form the south-eastern section of the facilities building. An atrium space rises the height of the building and is naturally lit from above. Conference rooms and galleries [on the succeeding two floors] lead to offices [...] set in landscaped grounds at the rear".   In addition to this the ground floor contains the site Control Room (CR), warehouse, extensive workshops, a laboratory, health suite, small meeting (shift hand-over) rooms, gym and changing spaces. Of these, only the CR and the shift hand-over room were part of the study, being the only places apart from the conference rooms, where groups of people (rather than individual in separate offices) worked together on a daily basis.

Company view of creativity

The company views creativity as just one of twenty-five different 'performance dimensions' coming under the sub-heading of 'Professional & Technical Competency: h. Creativity & Innovation: Involves generating creative or innovative ideas, solutions, or techniques having useful application'.   Under 'Results Orientation Dimensions' it appears as 'c: Quality of work: Involves quality of performance such as completeness,

freedom from errors, analytical soundness, creation of useful work products, etc.'. There is a company innovation scheme which looks at improved processes and safety procedures. Ideas have to go through rigorous safety analyses first, which are received differently by different people:

> We analyse things to death. [...] If I come up with an idea here it's going to be reviewed and reviewed and reviewed and reviewed before it ever gets done. [...] The other thing about creativity, my perspective on it, it's really -- we are under a lot of pressure to reduce costs and budgets are always being questioned and things like that. And it means that even relatively small amounts...if I come up with an idea to you and I say: I can't guarantee it's going to work but it's only going to cost you £10k and there's a good chance that it will work. £10k is peanuts around here. If it was my money I would say, just try it. Obviously if I come to you to spend £500k on something that might not work you're going to be more dubious. When they start to really pressure costs, even the small things like 'let's just do it'. Even that gets challenged. And that really crushes creativity. If you're being creative it's reasonable if somebody's going to spend a lot of money, but if you're only spending a small amount of money and there's a significant benefit and there's a reasonably high possibility that it might work, why don't we just do it.

The perspective from another member of staff acknowledged the procedures and saw them from a different perspective:

> The company is very open to people coming forward with a new idea, a new initiative. However, on the other hand, we are a very proceduralised company. If you think about the nature of the business [...] it does come with associated hazards. So for a lot of people in the roles that they are doing, protections on site etc, they have a very proceduralised mode of working. It is not to say that they can't think of another way of doing it, but before they would be able to take that idea forward they would have to go through numerous reviews. Maybe have to go through a Hazard and Operability study. So it is not that the company doesn't encourage it, but dependent on your role in the organisation there are a lot of procedures.

Both these perspectives emphasise MEC's commitment to safety as key in all its operations. The researcher had to undergo a rigorous induction process and was told clearly that contravention of any of the criteria would result in being asked to leave the site. The data collected, therefore, is relevant to small-c creativity with some middle-c creativity encountered in two of the staff who worked at a senior level with distributed teams, whose job was predominantly about problem-solving.

Company view of creativity of the building

The building was specifically designed for the occupying company, with a brief that, while it did not explicitly call forward creativity, did call forward core processes of collaboration and communication. BDP's summary of the building says:

> A new design approach was inspired by the clients' wish to introduce advanced management procedures on a philosophy of co-operation and teamwork. The only constraints were that all employees had to be within walking distance of each other [and] that their working spaces should be non-restrictive. [...] The office spaces were designed with glass rear walls to encourage access, but with the necessary privacy for work requiring great concentration.

Architect notes to the client at the design stage add:

> The client's objective is to construct a plant and buildings that will promote the establishment of a team of some 300 persons which will part operate the plant, and part support those operations. By 'promote' [the client] means that the plant and building's organisation and form will generate communication and interaction of those people working within the team.

In interview, the architect talked about how the MEC client had seen a previous BDP building where a central internal 'street' facilitated good communication between staff in different departments: "I would say it probably comes from the conceptual thinking of the architect. Meeting the aspirational aspect of the client (one man actually). [...] There was the street with cafes and walkways and communications and all the rest of it. [...] That thinking of offices/design/work/social function. [...] [[If in] a work environment and you are close and the connections are strong, socially it's strong if everybody congregates and everybody knows each others' names, the answer must be yes [to communication]. People could resist that – but there has to be a willingness on the part of the workforce to integrate. [...] I don't think you could determine it. Determinism."

Research process

The researcher was onsite for one week, preceded by a site visit and several weeks of negotiating access to the building (permission had to be granted by the company lawyers). Interviewees were chosen to reflect the different departments in MEC and different level in the hierarchy.

	Research Activities			
	Morning observations	**Afternoon observations**	**Interviews**	**Other activities**
Previous month				Permissions sought Research project introduced to staff
Monday			Feed & Distribution Scheduler (previously in HR) Community Affairs Assistant	Safety induction & building familiarisation Introductory meetings with departmental managers
Tuesday	Maintenance morning meeting Shift meeting	Control Room	HR Advisor	Meeting with Technical Manager to discuss access to staff and plant
Wednesday	On-plant observation of 2-person team		Process Engineer Applications Technician Reliability Engineer (+ conference call)	
Thursday		Maintenance Group (meeting of 3 people)	Electrical Technician HR Advisor (no recording by request)	Meeting with Technical Manager to arrange interview
Friday			Technical Manager Process Analytics Specialist Process Specialist Facilities Manager	
Following week				Survey issued

There were forty-seven responses to the survey, of which forty-six were completed and one withheld consent and did not proceed.

Appendix 8:   Focus Group 1: Data analysis by categories

	Preparation	Frustration	Incubation	Insight	Working it out
Places	At home At my desk in front of my computer in home office Writing in a busy public place	When I'm not where I want/need to be to solve the problem most effectively Most frustrated in the office Sitting in front of word for windows 'waiting' to write; not surfing, not checking emails, not having 'fun' online	Sitting at computer		Laptop in home office At computer Office (not at desk, in other chair)
Deliberate engagement	At my piano noodling around or playing the last song I wrote Last minute improvise Mixing my paints in studio, selecting objects for still life I'm going to paint Carrying out field research (playing games, virtual 'worldspace') I prepare in different MMOPGS depending on what sort of idea Talking to work partners/research group	Sitting at piano noodling trying various things Starting to paint (standing in front of easel) hating colour, shape, unable to capture object etc I sketch my ideas Writing on notebook Talking to friends	Sitting with a notebook in front of me, with no distractions Coding Writing Thought New observation Technical conversation Discussing or thinking about idea with access to internet	At piano Sitting with a notebook in front of me, with no distractions Taking picture Sitting in the sun reading PhD books Café diagramming Conversation Working with people Texting Pub over a pint Talking with others	Doing writing, preparing a presentation Looking at what I have written and using creative editing Writing on pad of paper with pencil or favourite pen Sitting with a notebook in front of me, with no distractions Working on an idea often already in progress. When working on something else a chain reaction occurs – so sometimes in the studio In the studio At easel, painting At piano Thinking out loud to office mate

					Shared conversation In the company of people with the most relevant skills, and most collaborative approach
Chance engagement	Surfing on line Googling, making notes etc Reading in the library				
Physical movement	On foot between gigs Walking outside thinking of what and when need to be done Writing Sketching Recording my thoughts on my mobile phone Texting myself		Yoga Cycling Walking Swimming Situations of flow, when my brain is often disengaged Physically moving Often outside I walk to or from coffee shops and toasted sandwiches! They are my 'thought' rewards Feeding pigs While running or practicing yoga/physical activity Swimming Walking around my lake	Feeding pigs Walking the dog Walking Swimming gardening	Walking (x 3) Swimming Aerobics Running When I walk..especially in the middle of the forest
Mechanical movement			Travelling	Bus Train In transportation	Driving On the train and planes On the tube or plane/bus
Disengage-ment			Yoga mat Sitting in my armchair at home, television's on Stretching the body Evening and night Watching clouds	Not thinking on the idea itself – abstraction Listening to music In shower In the bath In bed about to go to sleep	Lying with cats The zone between getting up Kitchen table waiting for my coffee to brew

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			By water Resting Bath is good Relaxing in the bath – eureka! In shower Living room sofa or other comfee place Dreaming Bed – lucid dreaming Relaxing in bed Bed almost asleep I play solitary virtual world games Morning Updating twitter	In bed on waking Dreaming	
Recycling					Reworking existing ideas
Reframing				Thinking 'Why?' finding the solution Breaking the 'I can't write barrier' and achieving writing flow.	
Continuous awareness of creativity	Wherever I can – always; it is always in the back of my mind Anywhere and everywhere		Anywhere I have time Everywhere all the time		

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Appendix 9: Summary of Research Interview Data

INDIVIDUAL PROCESS (Wallas 1926)			
PREPARATION	INCUBATION	INSIGHT	VERIFICATION
Preparing Observation Visualising Empathy Trigger conversations Questioning/asking/listening Gathering Scanning for possibilities	Active incubation (doing) Incubation (waiting) Reflection/solo time Idea developing & building	Visual Paradox Idea developing & building Cross-area synergy & links Challenge: to and from self Pain (effortful production) Unexpected, excitement & risk Serendipity Trigger/stimulus	Previous experience & knowledge Synthesis Refining Testing Other process pieces

GROUP PROCESS (Tatsuno 1990)				
RECYCLE	SEARCH	NURTURE	BREAKTHROUGH	REFINE
Mix people & levels Apply practice across organisational areas	Best practice Getting started	Collaborate Co-creation Creative processes Communications Teams virtual & real Meeting/discussion Discipline	How – methods for breakthrough Challenge Changing ideas	Testing Influence & buy-in Implementation

PHYSICAL PRESS		
SPECIFIC PLACE	PROPERTIES	AFFORDANCES
Catered spaces (cafe, pub etc) Busy public spaces Inside (office)spaciousness Outside with horizon Away from office Outside	Own territory in office Privacy (for small group) Privacy (for individual) Matching person & place Pragmatism Safety Fitting space to people/event Quiet Space for active chat Inside spaciousness Spaces that nourish Light and air Philosophy of space	Mixing with others Relaxation Walking inside Visual equipment Play and tech toys Open face-to-face communications
	Contra-indications	

PEOPLE	
Understanding creativity Self awareness Aware of own creativity Aware of own processes Creative skills Emotional needs (own)	Restricting/damaging stuff

PRODUCT	
New product Improved product Improved client relationships Improved internal processes Specific needs (organisation)	Personal Big-C creativity Strategy

Appendix 10:   Data Categories of the Individual Creative Process

The emergent categories are the four stages of Wallas' (1926) model of the individual creative process.

All 11 interviewees are represented in this section. There are 25 subsections. 7 sections have 5 or more respondees; 6 sections have 4 respondees (e.g. Processes – preparation are added to by three of the eleven respondents).

PREPARATION
Processes – preparation 3/11
> Half preparation/ half spontaneous brain
> Break script down – map moments when there is a change of thoughts [in the actors]
> Read one character at a time and work them out
> Work at home on the basics for other people
> Have a script, so half-way there
> Research and preparation, plus spontaneity
> Develop alternative ways of thinking

Questioning/asking/listening 4/11
> Ask: seek out other people's competence (eg airport staff)
> Example of learning – drunk group at airport showed how to get into system
> Learning: passengers can break the rules
> Being asked the right questions
> Questioning and constant testing
> Ask questions
> Teachers – seek them out
> Accept others' contributions – osmosis!
> Listen to what a lot of people have to say
> Gather information by listening
> Go to customers and ask
> Listen to people talk – and show you

Gathering 6/11
> Gathering info
> Gathering is most important
> What exists? Been done before?
> What can I learn? How can I use this?
> Gathering data inside the office
> Targeted reading
> Random reading
> Different physical locations
> Ideas now [in software] go and find what you need and glue it together
> Academic literature
> Web
> Common sense – seen through academic theories (MSc work)
> Reading articles

Rummage in books

Rummage on the web

Books: I don't read them, I use them. Dip

Rummage on Amazon – what books are there?

Books connect to different periods of my career, of time

Rummaging adds to the core of my understanding, making sense

Rummaging in books in the opposite place

Rummaging – going on all the time; fun; just life

Art enriches and informs life

Art helps you see and understand the principles by which we see the world

Observation 5/11

Observation

Process: stimulus/notice = idea

Observing practices [of other people]

I build tool sets from observing other people working

Observing = the inspiration bit

Pick up on something

Stop and notice what I'm seeing and hearing

How does what I notice inform the question?

Perceive, not conceive

Seeing, being present, is a business tool

Noticing myself and others – is a business tool

Scanning a room

Scan: for danger? What's here? Do I need to leave soon?

Scan: say safe and get out okay

Scanning for possibilities 3/11

Looking for issues and coming up with solutions

Opportunity identification

Aware of gap or issue

Consciously thinking: I need to create an idea here

Looking for difference

Antennae

Ping! Transmitter and receiver continually

Always looking for something

Seek: new people, new places, new ideas

Visualisation 2/11

Visualise problems as a puzzle (engineering background)

Visualisation

Pictorially in my head

Empathy 4/11

Creativity – use empathy

Stand in other person's shoes – what does it look like?

Get people to express themselves, so you get the info you need

Seeing things from the user's point of view

Self – adopt a demeanour that invites people in – invites people to connect

Use understanding the context in a room for creativity
Put self in others' place – how would I feel?
In other's place: survival technique

Conversations as stimuli/triggers 6/11
5 or 6 streams from conversation to formal brainstorm
Bounce ideas – gain energy
Bits from theirs, yours: see if it will work
Internal RBS networks
Kids: I learn, and am still learning (being silly)
Conversations with other people – create the basic thought
Conversations with other people (eg Jim W)
Write ideas – connect to other people
People talking at a practical level about what's going on

INCUBATION
Active incubation   2/11
Writing in bed [morning pages] was fantastic!
Write in the morning in bed and edit later
Used to do automatic three pages
3 pages: build the [writing] muscle
Got a dog, so the writing has gone
Work with ideas
Using metaphor to help understanding
Use metaphor in complexity/complex issues

Incubation 5/11
Being still: outside mirroring the inside
'Skooshing about' [ideas] outside the office
There has to be a solution to insoluble problems
Always thinking
Problems stay in my head; I keep on thinking – it doesn't go away
Live with the script in your head all the time
Need digestion time in a space
A3 pad: make a note, then go back and look at it properly [later]
Mind wandering in a meeting – making doodles and notes
Let go – think of nothing
Concentration on present process [eg motorbike] allows other things to happen in the background
'Skoosh about'
Always trying to make sense – continually
Let it settle
Let it ferment

Reflection/Solo time 4/11
Reflection inside and outside
Journaling
Quiet reflection

Talk as if to different people [talking out loud]
Talk out loud to self
Sometimes need to be solo for the 'click' to happen
Individual reflection
Always be a solo element in the creative process
Talking out loud: lets me bring the emotional element into it as well
Talk out loud: work that through...get rid of "negative effect [so that] doesn't become a black cloud over creativity
Working on the mental map

Idea developing and building   5/11

Ideas take time to develop
I build on other people's ideas
Make other people's ideas workable
I can see if the idea works/filter it
Brain let go: analyse, think, bring in new things
Brainstorming solutions
Structure time and place
Structure to generate more ideas
There is a construct to it – but sometimes there's not!

Visual 5/11

Visual – diagrams for each character [in a script]
Diagrams to back up instinct
Little bits of paper all over my desk
Scribbled notes
Notes stuck into book
Notebook
Illustration of the process (drawing it)
Use
- Colour coding
- Mind-maps (+ type up and present)
- Stickies
- Doodling

Need to start backing up notes into book/electronic etc

INSIGHT

Unexpected, excitement and risk 4/11

Excitement when reading [a script] and don't know why I'm excited
Excitement, explosion, flow
Work well with an 'edge'
Risk: exciting ideas will make risk okay
Banff – tension: it's not safe because of the bears
I land somewhere that I didn't think I'd be
Unfolding potential of something new
Seeing something of the first time [story of icon]
Comfortable with chaos and ambiguity
Sometimes creativity fails spectacularly

Cross-area synergy and links   3/11

Individual seeing synergies – applying learning from one place to another
Applying learning from one area to another
Use what works in A to improve B
Apply thinking to different contexts and range
Kids: cross-over of added confidence in own creativity into work

Challenge: to and from self   2/11

Need challenge from other people of different type and perspective
People can change from being obstructive to contributing [value their different perspective]
Challenge ideas: friends and associates from the other side of the fence
Challenge is a motivating experience
Mutual challenge
Builder challenged architect and contributed [another piece of the plan]
Challenge back: "challenge him [mentor] around his way of thinking as well"
My thinking challenged by colleagues
Challenge ideas – talk to customers
Trying to be systematic (eg in cooking) is challenging
Challenge: the change strategy metaphor
Challenge: how am I thinking about this? Blocking?

Serendipity 1/11

Loosen self from sense of purpose
Wander
Allow self to be surprised

Trigger/stimuli 2/11

Kids: is where I'm most creative
Kids: making up creative games
Thinking at a workshop

Paradox   1/11

Look for unintended consequences
Look for the paradoxical
A feeling is an idea not yet born
Live in the present moment
Transient/ passing – like cherry blossom
Paradox – sense and no sense
Don't rummage in the obvious place – that is yesterday's learning

Pain 3/11

Writing: start from scratch: 'laid bare'
Painful – judging myself
Editing is different, not seen as creative, more like salvaging
The unpleasant is still useful in situations and people
Choose events – if people's behaviour is unpleasant, ration my time there
Downside to non-conformity is reinventing someone's insight

VERIFICATION
Testing 4/11

Integral part of enjoyment

Apply and test

Test observation from different views

Testing the idea – self

Process: out – test – back – test – etc

Test ideas out

Test out ideas

"Weigh it up to people's different ways of thinking"

If no testing: come a cropper quite a number of times

Anticipate the questions

Testing against colleagues' modes of thinking

Going back and testing it with patients and carers [customers]

Refining 4/11

Refining is an iterative process

Continual refinement and improvement

Ideas – talk – rethink and relook – talk – go to boss "Grab a coffee… X Y & Z?"

Refine all the time

Small – bigger picture – bigger and bigger – action points

Micro info/ macro info – layers

High level – to detail level

Idea refined through challenge: the original idea can come out at the end completely different

Continue working on an idea – better, more interesting

Make the idea more challenging by continuing to work on it

Synthesis 2/11

Being still: seeing connections

Everything informs everything else

I can understand fundamentals

No partitions

Integrate: bridge in and bridge out

Synthesis of conversations and gathering – creates a paper etc

Synthesis as a written piece

Absorb and integrate it back in

Mixed approaches/miscellaneous 3/11

Work ideal: one week with people, one week solo

2 or 3 days at home, the rest in the office

Get ideas outside the office, and take them back in

Activities: you can be thinking and distilling your thoughts, then take them back [to work]

Congruence about systemic models

Get congruence [on systemic models] deeply into own consciousness

Nimi Wachi: Japanese moving the tree without shock in the transition

Active learning: learn a book by presenting it

Previous experience and knowledge – self and others 5/11

      Previous personal experience

      Ideas come from experience and mistakes

      Creativity – use knowledge

      Creative process: association – mine and others'

      See how people have done it in other areas

      When stuck: try to understand "where am I?"

      Parallels between activities inform the work

Miscellaneous process bits   2/11

      Prioritise – what's important?

      Aides-memoire for complex issues

      'Too creative' = head too busy = forget things

      Discipline to stop work at 5pm on a Friday (when working at home)

      Workstation, travel and home working

      No permanent base – new way of working

      Journaling: go back to an idea to work on it

      Journaling: notice stuff when flicking through

      Always mentally journaling

      Find routine unpleasant and claustrophobic

Appendix 11:   Data Categories of the Group Creative Process

In this category there are 20 subcategories. Both collaboration and generating ideas together (co-creation) are mentioned by 7/11 – the highest of any discrete subsection anywhere. 7 subsections have 4 or 5 interviewee mentions. Most of the sub-categories fall under the 'nurture' heading which reflects the high degree of social press perceived by interviewees.

Group Process (Tatsuno, 1990)

RECYCLE
Mix of people and levels   5/11
       Sharing experience = developing ideas
       Mix the grades – get ideas from both sides
       Get everyone's view, advice, experience
       Mix grades – get a wide perspective
       Build team with a mix of knowledge
       Need mixed grades for reality, therefore efficiencies
       Operational teams have really good ideas
       Mix the grades
       The right group of people are fantastic
       Testing and different personalities – challenge fixed thinking
       Different personalities: completer/finisher; implementer; plant [Belbin categories]
       Person who dots the 'I's and crosses the 't's.

Applying practice across areas   2/11
       One business unit practice applied in another
       Mix area experience so synergies are seen/recognised across areas
       Use others' experience
       Cross-fertilisation

SEARCH
Best practice   4/11
       Best practice sharing (company scheme)
       Lots of ideas from other departments with a different perspective
       Best practice transfer (from inside and outside the company)
       Share best practice across the department
       Sharing best practice
       Need clarity round the evidence base – reality
       Identify 'good' – leads to high level work

Getting started   3/11
       Early stages of a project need more creative interaction
       Starter doodle for small group – they can add and contribute
       2 idea strands: coming from customers and from the team working together
       Ideas build on a starting stimulus idea – a catalyst
       Starter ideas are 'just the direction of travel'

NURTURE

Collaboration   7/11

Need to be flexible

All contributing – not one person leading

Ideas from everybody

Ideas from other crafts (Director of photography, sound, the crew etc) – new ideas, new angles

Bounce ideas with costume, make-up, designers, editor

More ideas emerge from rehearsals and actors – a different track

Collaboration – makes it bigger and more beautiful

Edit suite – play with pace, perception etc

Initiation workshop – talk with business areas that are affected [by new process etc]

Input from people I collaborate with

Good unusual variety and mix of people

Collaboration

Collaboration with

- colleague – he simplifies and reframes
- other generators with different skill sets
- non-competitive people
- people with a strong sense of themselves
- people who can listen
- and have a strong point of view
- who are talented – 'stuff happens'
- person who is good at structuring (aware of my own gap there)
- complementary people
- people who add, not just implement

eg: builder and blacksmith (craft: folding metal) both added to the staircase

downside: maybe I'm not learning as much from people as I could

Develop and generate ideas together/co-creation   7/11

Bat them [ideas] around with stakeholders

All levels of stakeholders – senior people and colleagues

Stimulus from person to person

Batting ideas with stakeholders – 1 to 1 informally or on the phone

Peer to peer

Creative sharing of ideas

Other people's suggestions for making work easier

Sometimes with people for 'the click'

Co-creation with clients

People help you develop ideas – contribute and enrich your contribution

Creative processes   3/11

Planned brainstorm: Deep Dive methodology (IDEO)

- build paper prototypes
- destroy, keep core idea, build on it
- build, destroy, build rapid prototypes

Developing an internal project

- 2 meeting sessions with external providers

- Crucible for ideas – brainstorm with broad parameters of 'we think we know what the topic is'
- Evolves over time (2 months)
- Implementation ('Find the best idea' scheme)
- 3 products launched

Others:

- In pairs, walk around Chicago architecture and find a metaphor for how the problem is like a it of architecture
- How is the metaphor of architecture like an organisational problem?

Buzz sessions:

- introduced by external provider (Deloittes)
- less distractions
- talking
- daily
- group ideas
- quality team cascade

Don't like given processes – prefer simplicity and tools

Banter 3/11

Banter and people joining in across desks

Humour/tease/make things up (to test)

Deliver work formally or silly-ly, depending on the people

Communications   5/11

Create idea-sharing processes

Comms fail when: out of sight – out of mind

5-minutes table tennis decisions fail if not communicated

Buzz sessions – create good communications

Clarify understanding

All departments need to okay it [a project]

We live by email

We message, even in the office

We need an improved IT system with a calendar

Discipline   1/11

Craft/artisans

Need for boundaries – keep the core: say 'this behaviour is unacceptable etc'

M [company]: the core was good, the execution was poor

M: execution in conflict with the core – bullies

Need: how to get people adding in a disciplined way

When is something finished?

Teams – real and virtual   5/11

Team works well together

Assemble teams as they are needed

Need: team innovation

Need people to come with me

If you are a 'loner' you can't take the team with you

Team – sharing ideas in the office

Team construction – the physical set-up and the people impact hugely

Create team processes

Develop a shorthand with the team

Develop relationships with people (on the phone + +)

I work best in small groups

Work with project team between data gathering and getting a testable idea

Give people the confidence to take risks

If people are not confident, they will retreat

Group reflection 2/11

Reflect as a group

Visible management (large Gantt chart)

Process – meetings 5/11

Interruptions (phone) at meetings kill the flow and waste time

Don't like meetings – they are a waste of time

Ideal: ban laptops and mobiles in meetings

Scan the room – is it a fun group? Do I want to be here?

Meeting people brings richness

All have pens, all write on the paper

Flexible meetings – paper is on the table, not a flipchart stand

All add to the ideas on the paper, circle words, good

All up over the table, writing and chatting at the same time

Meeting/discussion types   3/11

Asked questions to things about certain areas

Group discussions – get different people speaking

Speaking from the floor only works for a certain mind-set

Small groups in small rooms = less travel for everyone

Lunchtime informal 1 to 1s – chatting too

Informal lunch and natter

Walking meetings
- dealing with conflict – reduce 'sting'
- random interruptions – relax (eg chefs and wine)
- physical focus – reduces hierarchy
- negotiate the random
- stop and sit
- outside if possible
- 3 times round the Business School (inside or outside, depending on weather)

BREAKTHROUGH

Challenge   2/11

Challenge

Ask why

Challenging to and fro with colleagues (especially ones with very different approaches)

Challenge from people with different skill sets and styles

Ideas change   2/11

Idea becomes something completely different

Implementation of the idea constrained by budget etc

My idea interacts with other people to shift its development

End up in a different place than you imagine

How: methods 2/11
Group workshops
Use existing procedures

REFINE
Testing 4/11
Iterative testing with colleagues
Do the same script in an infinite number of ways
Testing in the office – an iterative process
Test the idea with others
Chat and re-think
Flesh it [the idea] out first, then talk about it
Talk it through with other people after it has been fleshed out

Implementation   4/11
It's not so much the ideas, it's realising them, is the key
Balance between idea and reality
Implementation can dilute or destroy an idea
Go in BIG (it'll probably get whittled down)
Need great methodical implementers
Implementation in the office – setting it up
Need a completer/finisher [Belbin category] in the team
Collate the ideas – type them up
Direction is facilitation and creativity

Influencing/buy-in 1/11
Buy-in in the office
Buy-in is necessary – taking people with you

Appendix 12:   Data Categories of the People Element

People are very aware of their own abilities, needs and skills. 10/11 people are represented in this section. Of the 6 sections, only 2 are under 5/11. in the final section, 5/11 people are aware of the elements damaging to their creativity.

Self-awareness & noticing   5/11
> Self-aware – happy with who I am
> Happy in my own skin
> Need to be self-aware
> Eureka – realise my own position/permission
> I can be myself
> Creative confidence to try different things
> Give self permission to work in odd places
> Start thinking about how you are going to do it yourself (set direction etc)
> Know your strengths and delegate
> Need more discipline – be 'less fluffy'
> Learn from mistakes – what can I do differently?
> Learn from mistakes
> Low boredom threshold
> What is my impact on the situation?
> Self-awareness – huge learning
> Self-awareness can be uncomfortable
> Influential people – coaching to raise inner self-belief
> Noticing – what am I feeling?
> Noticing/self-awareness
> Self-correction/noticing
> The only thing I know to do is to turn up as who I am

Understanding   4/11
> Creative understanding and motivation through kids
> Extrovert processing – find people stimulating
> Personally developed so know priorities
> Motivation: people want to do their best
> Reward and recognition scheme (doesn't motivate, does say thanks)
> Kids: creative games and motivation/incentives
> Art – helps you see the world in a deeper way

Skills including coaching   6/11
> Creativity – adapt your style
> Leadership – empowerment and delegation – give people full ownership
> Developing people
> Motivation people
> Implementing and setting up projects etc
> Coping skills
> Negotiation
> Facilitation

Efficacy
- at a deeper level
- trying different approaches [eg with garden weed]

Metaphor – think about efficacies in different way

How do you add vitality?

Develop craft
- don't be intellectual only
- develop judgement
- being present in your own work
- problem-solve from all of self, not just head
- do this and it works, then take it and build on it

Coaching
- others
- personal devilment re collaboration
- informal coaching others
- Business School project – develop other people
- Business School work – people all want to be involved
- Reputation: he will get you to do stuff. Leading to personal development
- Indirect training of others

Emotional needs   5/11

Feeling competitive – motivated to improve things

Aligned people – eg Ehama – feed the intellect and emotions

Aligned people – nobody's behaviour will force me into anything I'm not prepared to look at

Being valued makes the ideas flow

Feeling valued and thought about in a space

Appreciation = understanding and time

Moving on, moving on, is not good for me

Now, with permission and empowerment it's 'shoulders back, chest out, head high, moving forward'

Not moaning all the time – interpersonal relationships are better

Needs:
- To make sense of life, the universe and everything
- Values
- Aspiration
- To speak to the heart
- Awareness of expectations, possibilities, opportunities
- Feeling, sense, passion
- Identity (not brand)
- Wide open mental spaces = scared!

We are not machines, we are biological systems

Wholeness – how to bring wholeness to what you do

Grace – people respond to it

Trust – self, trust feelings

You: are a thinking, breathing, living, loving thing

Fear: overcoming it is the challenge

Tension: between determination/tenacity and fear

Fear: how to let go, and make judgements

The nature of life – determination takes me uphill; fear takes me downhill [riding a racing bicycle]

Let's try again: resilience

Aware of own creativity   3/11

I generate different ideas
Thinking out of the box
"no guru, no teacher, no method" approach to life
I'd rather find the wheel than take it off someone else
I can see things in a fresh way
The upside of being a non-conformist is creating insight
Mine [ideas] can be off the wall
Blue-sky thinking
I could come up with ideas, I could distil them
Ideas are a big part of who I am
My ideas are over the horizon

Aware of own processes   5/11

Creativity and adaptability
I don't analyse – I do 'top of the head'
Choose to do the job that suits your mood – luxury!
Need not to know what happens next
Maybe I have lots of ideas and dismiss them because there is no follow-through
Start off with a hunch
Need follow-through on ideas/ implement them immediately
Editor needs a feel for the work
I like to work in a creative space with like minds, respect, purpose
Try/rummage/journal/ideas/twist them/do
Use journaling
Learn from writing things down
Don't like rules
'I'm a bit of a non-conformist'
All thoughts are metaphors, we just don't know what they are yet
Flow is wonderful
Creating, rummaging – it's an attitude to life
I can work on a script anywhere – the world disappears
Attention: 'hear the bell' [in church] and be present
Need to make things visible and explicit
The script is inspiring, so I love having it in my head
After the info is 'skooshed' I sit down and plan the implementation

Restricting/damaging stuff   5/11

Self-restriction
Self-limitation
Producer can crush ideas
Old lab impact: physical, psychological, creative – amazing how powerful
Affected by others' responses (inconsiderate)
Lab: was in a situation where it was all 'take, take, take' and not an awful lot of give
Damage, waste – difficult emotionally
Lack of appreciation – lose people, they turn the back

Appendix 13:   Data Categories of Social Press

8/11 people mentioned encouragement and permission from the organisation, other people, the processes themselves, with an environment of safety.

Encouragement from the organisation 2/11
>Encouragement from company
>Work context: create solutions for customers' issues
>Everyone encouraged to have ideas
>No idea is a bad idea environment
>Top-down encouragement for idea-generating
>You must be creative
>Context influences what you can and can't do
>Institutional permission
>Permission "You can start pushing the boundaries/break down imaginary walls"

Encouragement from others 3/11
>Active encouragement to work/to think differently
>Present-ness discouraged
>Encouraged all the time to have informal chats
>The more I'm valued, the more I feel my ideas are valued
>Value and respect is a gift
>Encouraged to develop (MSc)
>Coaching from influential person "Don't seek permission – go and do it and see where that takes you"; "What do you think?"

Encouragement from processes 2/11
>Dress down Friday – relaxed
>Flexible meetings – movement is okay
>Flexible meetings – go to fridge, get water, yoghourt, coffee etc
>Informal meetings quite good
>Take break for 2 mins in meetings
>Could be held in boss's boss's living room
>Comfy clothes at strategy events
>Buzz sessions create the conditions for ideas
>Put ideas forward in buzz sessions
>Empowerment – advisors [lowest grade] do the notes
>Go outside and listen to music

Other people 3/11
>Combination of space and people – not just space
>Need trust
>Office environment depends on other people
>Grotty environment is okay if the other people are great
>Grotty environment is awful if the other people are downers
>Different types of people need different structures. Business change comes out of left field

Audience influences what I give
Develop trust with the audience and they will go with you

Permission from others 3/11

Being given, subconsciously, permission to think again
Permission to think in odd places
Stand outside how things 'should' work
Not a career civil servant, therefore challenge from me is allowed
Need the right context that crystallises things for people

Fitting space to people/event 3/11 [also in physical press]

Permission to be different in a different space
Other space (eg Birnham Institute) and I get all my work done, plus other stuff too
Need to get it right, or the other people can't function
Senior people allow interruptions when they are in the office [in a meeting]
Senior people relax out f the office
Formal structure for strategy day (facilitator, leader, note-taking)
Do company stuff in big hotels, with break-out spaces
Structured and flexible
Fit the space to the people
An open environment is less regimented/less structured and leads to more creative work from people
Coffee shop or office? Formality is necessary for some people

Safety 3/11

Feel safe to be yourself – brings out the best in me
If I feel uncomfortable and nervous in a space I get angry at myself and don't do good work. Very much links to the space.
Like workshops outside the office environment: no distractions for the workshops
'Appreciating how threatening that can be, spending a lot of time thinking how are we actually going to think this through?'

Counter-creative stuff   6/11

In the NHS now, the idea of 'the creative professional' is thwarted
Asking the customer "does not sit comfortably with everybody"
No permission to challenge; Work by the book impinges on creativity
Rigidly run meeting: "That's enough of that" – my creativity and motivation were severely lowered
Confines of a meeting very rigidly constructed
"I never went back to the colleague to continue the discussion" [which had been cut off in the meeting]
Senior person asking: why the horse-shoe arrangement, why not boardroom?
Wasn't the environment to take it forward that I'd previously been used to
Expectation that tradition would be followed [in meeting format]
Government office procedures – very complicated
Gov offices:
- no talking
- hierarchy (furniture, biscuits)
- no empathy with visitors

Office – pressure to be 'work-y'

Pressure of time lowers my motivation [to be creative]

Power increases the damage possible

Affected by people [misuse of power] – damaging

Impact of old lab environment – feel my whole body slump

Lab environment + tension between senior managers = "creativity stopped"

Personal tensions impinge on my creativity

Power-play and personal agendas damage creativity and work generally

Tension dampens down creativity

Senior people don't ring-fence their workshop time

Present-ness: being seen to be doing your job – no trust

Not acceptable to 'go where the flow takes me'

Producer [film] constrained by budget

Appendix 14: Data Categories of Physical Press

Main data cluster headings

Where/what	Characteristics	Affordances & what is afforded	Emotional impact/aspects
Outside 3/11 Outside/horizon 3/11			
Inside space/ spaciousness 5/11	Light and air 5/11 Quiet 1/11 Privacy (individ) 2/11 Privacy (small group) 3/11 Lack of interruptions 4/11 Own 'territory' in office 4/11 Space for active chat 1/11	Relaxation 5/11 Play/technology toys 1/11 Visual equipment & affordances 4/11 Physically mixing people from different areas etc 1/11 Open face-to-face communications 4/11 Walking inside 2/11	Safety 2/11 Place & space influence people 6/11 Matching person & place 3/11 Spaces that nourish 2/11
Catered spaces 2/11	Away from office 3/11		
Busy public spaces /11			
			Misc. ideals 2/11 Pragmatism 3/11 Philosophy of space 1/11 Counter-indications 7/11

197 mentions of physical space through the eleven interviews; every interviewee mentions the WHERE and WHAT of physical space

Outside 3/11
      Walking the dog
      Long walk and thinking it through in my own head
      It's the sense of freedom that you have with it
      Weather makes no difference
      Walking
      I normally do all this [walking] talking out loud to myself
      Momentum – body forward, and thought forward

No pressure of time on a walk
Ideal: lots of space outside to walk in
Ideal: terracing

Outside/horizon 3/11
Banff:
- Open mountain scenery adds value – creates a film set for you
- Own space/film set created
- view of the mountains
- different physical position changes how you see the world
- reprocess and re-evaluate things you thought you knew
- factors (including altitude) force you to re-evaluate in different ways
- loss of scale – "god perspective"
- physical locations heal the soul

Garden for chat – chilled & quiet
Light + views of the garden are good for work
No confines of physical space = "psychology in your head follows trails of thought all the way through"
Camping/motorbike: perspective, seen differently
Physical location = awareness of how connected things are
Need – to view the garden
Ideal: roof terrace (& wifi)
Ideal: see the outside, see the view

Inside (office) Space/spaciousness   5/11
Need bigger spaces for meeting rooms
Feels bigger and less like a meeting room
Space: need height
Vital: empty space
Big spaces have very powerful effects
Space: go to St Paul's – wonderful space
I choose good spaces; big open spaces
M. in Bathgate – a fantastic space to work in
IOD – amazing physical space; incredible spectacle
IOD – big open space – distance is important
Concentration – happens in great spaces
For "skooshing about" [letting ideas mull over] I need the wider space. Depends on where   I am, how the space manifests.
Colour
Look for colour, harmony, a window seat

Catered spaces 2/11
Work and write outside the house, in cafes
Out of the office:
- coffee shop
- restaurant
- park

Pub for team meetings

Prefer restaurants for 1 to 1 meetings

Busy public spaces   2/11

Ad hoc spaces: with connectivity [wireless connection]
Busy – let the brain go
Busy – stand or sit – pause
Something different happening
Affects physical perception
Detachment

PROPERTIES

Light and air   5/11

Ideal: able to open all windows
Light and breezy – blinds open
Need to be seated by the window
Need light
Ideal: to have natural light
Need light (eg not on the ground floor of a hotel)
Principle: light costs nothing
Light – very important, how it affects your mood
X there are no windows so there is a strain by 4pm

Quiet   1/11

Sound screen
Need quiet – very important

Privacy (individual)   2/11

Privacy for phone calls
Privacy for phone calls, openness [of speaking] required

Privacy (small group)   3/11

Need a quiet area for 2-3 people
Quiet relaxed area for thinking (not a canteen-type area)
Need sound-proofing [so that noise stays in, and doesn't disturb other people working nearby]
Need privacy
Little coffee rooms for chat
Created a breakout space with tables and a whiteboard
Breakout and meeting rooms
Ideal: breakout spaces

Lack of interruptions 4/11

PC-free space would be wonderful!
Get into the office before other people, and stay after they have left
Buzz sessions best away from desk
X Desk by the door – have to open it for other people
X Open-plan: will it be a distraction?

Own 'territory' in office   4/11

>Use desk to "go through it"
>Lots of room on my desk (a sort of table)
>Space for different bits of work
>Tiny [side] table for 'stuff'
>One big table – fluid and nice and easy
>'Glass bubble office'
>Team space
>- breakout spaces
>- tables not divided – creates solidarity as a team
>
>Home office
>- Development and thinking time
>- No interruptions
>- Spread everything out – mental assemblage
>- Complete guddle – works for me, I'm tactile

Space for active chat   1/11

>Chat: 'Red Chair' space

Away from office   3/11

>Private and informal
>Idea-generating happens outside the office
>Read the script at home
>Need to think away from the desk
>Not an office feel
>[I do] very little thinking in the office

AFFORDANCES AND WHAT IS AFFORDED

Relaxation   5/11

>Comfy seating
>Beanbags/ chilled
>'Red chairs' space (+ table football)
>Open, relaxed, chill, go with the flow
>Relaxed setting (eg, booked room with flips and post-its)
>Go to the hairdressers
>Buzz sessions in chill-out area
>Comfy chairs

Play/technology toys   1/11

>Space with toys (technology) equipment, to play in

Visual equipment & affordances   4/11

>Visual thinking on wall – flips, post-its etc
>Visual seen as 'formalised' way of doing it [ie in the company practice]
>Visual, clustering, themes
>Ideal: lots of wall-writing
>Mind-maps and spider diagrams

A3 pad used as a mouse-mat to write on just as the idea happens
Ideal: pinboards
Flipcharts
Table, flips, post-its etc
Whiteboards
6ft long Gantt chart
Work materials: post-its, pens, blu-tack
Screen for data projector

Physically mixing people from different areas etc   3/11
Mixing grades
Mixing departments
Ideal:
- Everyone on the same floor
- People in the same kinds of areas
- Mix up people from different departments

Open face-to-face communications   4/11
Open-plan – chat across desks
Open-plan – good for informal discussion
Shout across desks
Informal communications – shout to each other
Seated at an angle to everyone – not have your back to anyone
Ideal: hubs of activities
Ideal: central place so you are physically standing for feedback
Ideal: desks in spiral – people have to walk past everyone
Ideal: big space at centre [of circular office, like The Gherkin] for big chat
Ideal: moveable desks, in layers like an onion

Walking inside   2/11
Fridge takes people past other departments
Walk inside "pick up people on the way"
Walking meetings

EMOTIONAL IMPACT & ASPECTS

Safety   2/11
Airport lounge: protected space – free the mind
Ad hoc protected spaces (especially in London)
Safe space: come back to be whole again: Mum and Dad
Own space: pleased and happy with it. Grounded in it

Place & space influence people   6/11
Agenda structured by room format
Different space gives freedom to be different
The disruptive rhythm of different spaces (especially to senior protocols)

Space and place are something you react to
I manipulate space and place for effect
Being in different physical settings 'was always very challenging'
Space helps in different ways
Business school space: built on assumptions
Business school layout with expert at the centre; but people want flat collaborative space
Ideal: flat classroom for cabaret-style layout
Unlearning old habits [of behaviour in an office space]
Old habits – never left the [home office] space, couldn't switch off
Space speaks on different levels of
- Need
- Security
- Restorative
- Educational etc
Physical locations bring ideas and opportunities for ideas
Use different environments depending on the issue or the group – very refreshing
Architecture says something about the formality or informality of doing
Structure of the meeting room influences whose voices are heard
- Very visible = will keep quiet
- Informal = will talk
Office supports 'the normal way of thinking'

Matching person & place ("People go where they are most comfortable") **3/11**
I set up meetings in particular places
I chose the space to fit the people – not necessarily verbalised
Certain places for certain things
Choice – there are a variety of spaces in the Business School
If I feel comfortable in a space and like it, I do good work
Different types of people have need of different structures (eg IT)
I match the person to the place (formal/informal) for the output

Fitting space to people/event 3/11 [originally in the social press section]
Permission to be different in a different space
Other space (eg Birnham Institute) and I get all my work done, plus other stuff too
Need to get it right, or the other people can't function
Senior people allow interruptions when they are in the office [in a meeting]
Senior people relax out f the office
Formal structure for strategy day (facilitator, leader, note-taking)
Do company stuff in big hotels, with break-out spaces
Structured and flexible
Fit the space to the people
An open environment is less regimented/less structured and leads to more creative work from people
Coffee shop or office? Formality is necessary for some people

Spaces that nourish   2/11
Free fruit and vegetables, water and yoghourt

I seek out teaching spaces
Teaching spaces where learning happens (eg exercise with trainer)

MISCELLANEOUS

Misc. ideals   2/11
Round office – more fluid [like The Gherkin]
Industrial loft space
Gherkin – circular glass room (views all round)

Pragmatism   3/11
Make the best of the space you've got
Convenient, within budget, good size
Influencing happens in the office

Philosophy of space   1/11
Principle: create the curve (not angular)
I can understand it, but not do it
Space is not empty
Space is very important
Use of wasted space [in own office] is deliberate – not totally pragmatic
Need boundaries, or space loses its form
Space and sense of space is very important for getting ideas
Aesthetics very important
- Spirit
- Feeling
- Elegance
- Grace

Bike
- Represents a lot to me; it is important to have it here [in the office]
- Sometimes I cover it up with a sheet, so I can see it anew [like the icon]
- Sense of wholeness
- Aesthetic
- Red: choice not to blue, not to conform

Space – I need to shape my own space
Own space: Convergent space where ideas go down on paper

CONTRA-INDICATIONS

Office   7/11
Work churn only (emails, papers etc)
Only use the computer in the office (process only)
Office not a good environment for creativity
Dislike the physical confines of being in an office
Divide between departments because of how we sit
Got to get up and move to speak to other department round the corner of the office

Unsafe: sometimes the flow is not so good, or not there, or I need to create it

Old lab office: rows round the wall and bar stools – awful to work in

'Horrible room':

- No-one cares about the room
- Plastic seats
- Use only for quick chat or phone calls
- Bigger expenses for going out rather than use it
- No windows
- Little door
- Dark
- Light is movement sensitive (so goes out when you are in there unless you move)

Car:

- No ideas in the city – cyclists!!!
- Phoning only
- Too much driving is destructive
- Phone calls only
- Stop and use computer

Rubbish left on table

Desk beside staff table, so stuff gets on mine

Poor space = bad place to work, makes customer service difficult

Front desk: poor lighting, no legroom or space

Clean desk policy – found it difficult

Must be in the office: 'present-ism'

People using space to unsettle and manipulate (my chair)

Government offices: space too quiet – not safe

Appendix 15:   Creative Process Diagrams

Creative Process

No. 1
(Positioned to the
left of the cards)

TOWERS – holding area

Transcendence

3) fermentation

question

needs

Too much thinking

Known
Obvious
Unfamiliar
familiar

Level 1 – cut-off point – level 2

Flexibility
Incomplete

PLACE

CUTS

Left brained order
Ingredients list

Random associative structures

Authentic randomness

Spectral Chaotic serendipity border

Natural selection

PRIORITY 1)

PHYSICAL

Reduction of
possibility

Collaborative

compromise

1) ORDER

Continuums

REDUCTION

Continuism

Levels of expansion

Arbitrary
Place
PRIORITY

Vision – seen & unseen

NATURAL

URBAN

movement

STARTING POINTrails

LOOKING? NOTICING GAPS

?

INFLUENCER

GATHER STUFF

WORK IT OUT A BIT

CHAT MORE

TALK/CHAT

RETHINK EVALUATE

RIO

CAN ONLY ARRIVE
AT CREATIVE PROCESS
WHEN DAYDREAMING

DISLOCATION FROM ROUTINE
+ DISCOMBOBULATION

OCCASIONAL
INTERESTING
CONVERSATIONS

PRESENTED WITH
SITUATIONS THAT
ARE NOVEL & UNIQUE

&

DE-ENGLISHING

DOING AN IMPERFECT VERSION
FIRST

No. 6

+ PLAY

But by myself
I gain insight when
I'm travelling

SHARE
Thinking +
Inspiration

Non descript
Location

Strong need for
Isolation In order
to reflect

But
Comfortable

Hand Activated
Documenting
(Writing)

!! Engagement !!

Thoughts to paper

No. 7

+ PLAY!

No. 9
+ Time/temporal
Day/night

Outcomes/
Product
Artefact

Collect
&
Immerse
&
capture

Monitor/
Do
Actions

Identify & name
PROJECT

template

Devise
scope

Outcomes
aims

timeframes

Visible
Thinking:
html

Define
Responsibility

Noisy

Define
Actions

PRIO

Music
broadcast

Subdued/
Dim light

Natural
light

Aspire

Bump into
people

Visible
thinking

Views

Wide
reading

Tea & coffee

Train

Visible
Thinking:
face2face

No. 10

Wide
reading

Tea & coffee

Train

Visible
Thinking:
face2face

Done!
Complete!

Connect with
New ideas

Surround &
Immerse
informed

Neutral/no
smell

Draft
Stretch
Mindmap
Expand ideas

Finalise

Identify
select

Refine
Define
adjust

Cool

Breeze

Feedback
"sleep on it"
reflect

Refine
Define
adjust

Calm

Silence

Aspire

Bump into
people

Visible
thinking

Views

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Gathering
Unrelated wide reading
Keeping notebooks
Experimenting (Meccano etc)
Inspirational people

Practical

Think it through

Philosophical

Conversation with
Maker/log books

Private 'chat' book

Challenge

Clearing the mind
Go up the hills
Look up Killiecrankie

Incubate

Continual gathering
Unrelated wide reading
Keeping notebooks
Experimenting (Meccano etc)
Inspirational people

"Sleep on it"

Idea/train
of thought

Creative Process: JC

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Appendix 16: Review of Literature on the Senses

Table 19 (page 115) summarises the literature on the relationship between the senses, the physical environment and creativity. This appendix reviews the literature in greater detail. The review is structured round the six meta-categories identified in the respondent data: comfort, sound, sight, spaciousness, movement and aliveness.

Comfort

In their analysis of environmental factors that lead to increased job satisfaction, Brill et al (1984) identified 'comfort' as contributing to employee motivation and stamina. Comfort is a core data category in this present study, emerging from respondents' indicated preferences and environmental issues that hinder or help their creativity. The subcategories of comfort include the senses of taste, smell and touch: taste and smell appear through data on air quality, temperature, and smell; touch emerging in data about furniture (sofas and chairs in particular). These subcategories mirror Brill et al's (1984) key factors of furniture, noise, comfort, and temperature/air quality.

Comfort: Smell[32]

There is a significant body of scientific research into the effects of odours on physiology and psychology (Chebat & Michon, 2003). In the field of consumer studies, smell (Chebat & Michon, 2003) is examined in its capacity to impact people's emotions and hence their buying patterns. In studies of odour in the workplace the focus has been predominantly on employee health. However, in a laboratory study on odour's effect on creativity, mood and perceived health (Knasko 1992), mood and reported health were adversely affected by an unpleasant smell, but creativity levels were not significantly affected by pleasant, unpleasant or neutral smelling test rooms.

Comfort: Touch

The field of consumer studies has examined affective responses to different aspects of the environment, where perceptions have been affected by flooring types (Meyers-Levy & Zhu 2007) e.g. soft carpeting and hard tiling. The potential impact of furniture on creativity is rated highly by Brill et al (1984); however in a study by Ceylan, Dul & Aytac (2008) exploring whether the office environment can stimulate a manager's creativity, furniture was rated as part of *spatial arrangement*. The study found no

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[32] Taste as such did not emerge as a separate data category, and is subsumed under smell.

effect of furniture on creative potential, but the authors suggest that this may be due to furniture being perceived as an aspect of complexity (Ceylan et al 2008: 17). Alexander et al (1977) suggest that rather than uniform furniture, different kinds of chairs contribute to a place's sense of aliveness.

Comfort: Temperature (including ambient air quality)

Studies of air quality (Milton, Glencross & Walters, 2000; Wargocki, Wyon, Sundell, Clausen & Fanger 2000) have found that by increasing ventilation rates, lowering humidity and using outdoor air, incidents of short-term sick leave can be reduced, and morale and productivity in staff increased.

Sound

The field of noise and its associated impact upon people in the workforce includes organisational health and wellbeing. In the context of this study three works are examined. Brill et al (1984) identify noise as the second most influential comfort factor (after furniture) that affects employee motivation and stamina. Stokols, Clitheroe & Zmuidzinas (1996) identify high levels of environmental distraction, specifically 'unpredictable or uncontrollable physical stimuli and events such as noise or prolonged exposure to crowded environments' (1996: 138), as contributing to employee stress and to employees' perception that there is poor support for creativity in their workplace. Finally Toplyn & Maguire (2009) conclude that the impact of noise (or arousal) levels on creativity vary depending on the mediating effect of individual differences. Thus while individuals have different tolerances and responses to sound (borne out in the data) once noise levels reach a pitch that impacts them, their perception of the workplace as supportive of creativity diminishes.

Sight

"The sense of sight […] is the sense where the sun of consciousness rises, and we reach full waking consciousness" (Steiner 1916). Architecture and the built environment have traditionally been dominated by the sense of sight (Pallasmaa 2005). This study, however, focuses on the role of particular aspects of sight in the stimulation and support of creativity: the effect of views, of light and of colour.

Sight: views

The views observed and reported in the research data from a workstation or office vary hugely: natural (R11) or built (FT2 and Case Study 1) environments, panoramic (Case

Study 2) or enclosed (R10). They may even be non-existent (PT1). The effect of views has been examined in the literature in terms of well-being (Kaplan, Talbot & Kaplan 1988; Heerwagen 1990) and biophilia (psychological attraction to life, aliveness or living systems (Fromm 1964) or naturalness (Ulrich 1984, 1993; Barrett & Barrett 2010); of connection with the outside context (Kelly 2001; Roessler 1980; Wyon & Nilsson 1980); and also of the status conferred by being near a window and in sight of views (Duffy 1997). The literature supports the data findings, set out in Chapter 5, that views are important to respondents for well-being, stress-relief, reflective and creative moments, and connection to the outside. The role of status did not emerge in the data.

Sight: natural light

> Light: The sun is a rich source of light for the illumination of forms and spaces in architecture. The quality of its light changes with the time of day, and from season to season. And it transmits the changing colours and moods of the sky and the weather to the surfaces and forms it illuminates. Entering a room through windows in the wall plane, or through skylights in the roof plane overhead, the sun's light falls on surfaces within the room, enlivens their colours, and articulates their textures. With the changing patterns of light and shade that it creates, the sun animates the space of the room and articulates the forms within it. By its intensity and distribution within the room, the sun's light can clarify the form of the space or distort it; it can create a festive atmosphere within the room or instil within it a sombre mood. (Ching 1979:181)

The data categories for natural light – its benefits and people's need for it – were saturated early in the data collection and analysis process. Where respondents were working in windowless environments they commented on the lack of light as well as on the lack of views and connection with the outside (especially in Prototype Test 1). This need is echoed in the literature. The impact of daylight on learning is studied in the work by The Herschong Mahone Group (1999); the tension, raised in the data, between light and glare is examined by Christoffersen et al (2000). Again the biophilia hypothesis is relevant here, questioning whether the effect is due to the natural lighting or to the views from the windows that let in the light (Boyce et al 2003).

Sight: artificial light

> Conventional lighting strategies enable us to see well enough to perform visual tasks, but they keep us in biological darkness and often an unnaturally bright environment at night. (Hobday 2007:16).

Reactions to artificial light were mixed in the data, and did not often come forward. In Case Study 1 the graphics staff preferred to work in semi-darkness because of glare. In

Final Test 1 where only managers had windows and direct light, the staff appreciated and enjoyed the office 'mood-enhancing' up-lighters that imitated daylight. They also preferred the new diffused ceiling lighting to the old, harsher florescent tubes. This accords with research done on the effects of artificial lighting that mimics the full daylight spectrum, showing how it works with circadian rhythms and emotion (Joseph 2006). Finally although Vilar (2010) looks at the effect of light sources on creativity, she is concerned predominantly the big-C creativity of artists and designers.

> One thing we can all agree on is that the light emitted from LED and CFL light sources is still not as inviting and colour reliable as that of the incandescent lamp. Our traditional and "energy inefficient" lamp, source of creativity, and source of all social and cultural development, is still incomparable to any other artificial light source (Vilar 2010: 284).

Further work links the effect of artificial light on mood and hence on creative performance (Franz, 2004; Barrett, 2010; Dul & Ceylan 2011; Ceylan, Dul & Aytac 2008; Hygge & Knez, 2001).

Sight: colour

There is a wide literature on the psychology of colour. The literature that is most relevant is that of the impact of colour on mood, where mood is linked into creative performance. This work is closely linked with work (above) on artificial lighting, where intensity and hue affect mood (Knez 1995; Hygge & Knez, 2001) and positive mood is linked with increased creative performance (De Dreu, Baas & Nijstad 2008; James, Brodersen & Eisenberg 2004).

Spaciousness

Spaciousness as a discrete sense emerges as a saturated category in the research data of this study. In terms of enclosed space, it is predominantly studied within the field of Environmental studies. The literature draws from diverse sources, including neurophysiology, psychology and mathematics, and centres round the theory of *enclosure*. Spaciousness is most usually calculated by geometric measurement of *isovists*, or the amount of enclosed space visible from a single viewpoint (Franz 2004). Spaciousness is a predominant aspect of space in terms of its impact on the emotions. It is held in a specific part of the brain (the parahippocampal place area or PPA) (Epstein & Kanwisher1998), hypothesised to have developed in early humankind for survival. Important aspects of spaciousness in neurophysiological terms are the degree to which a space permits or limits movement and perception (Stamps 111 2005) and its degree of

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complexity, and/or boundary roughness (Stamps 111 & Krishnan 2006). In other words, how might the space permit a primitive human to survey the near and far distance for danger, and be able to hide or flee from threats. The theory of enclosure, brought into present-day terms, looks at the affective impact of spaciousness, and in particular at which properties of a space (most usually indoors) contribute to emotional or affective responses (Franz 2004)[33].

> In order to describe the underlying factors, terms such as complexity, diversity, visual entropy, perceptual richness, order, legibility, clarity, and coherence have been used. All in all, there are strong indications for two main dimensions within the collection of related concepts, which may be provisionally, termed *complexity* (implicating diversity, entropy, richness) and *order* (comprising legibility, clarity, coherence). (Franz & Wiener 2008: 577-578).

Franz has found strong similarities between individual environment–related emotional responses, concluding that affective qualities of architecture can be systematically investigated (Franz, 2004). In a study originating in consumer studies, ceiling height (Meyers-Levy & Zhu 2007) was found to affect thinking, with high ceilings promoting more conceptual thought, and low ceilings (eight foot or less) more detailed attention.

As a secondary feature of spaciousness, a data category of messiness/orderliness emerged from the analysis. Respondents differentiated between constructive mess (a wilderness of free-association) and destructive mess (no-one taking ownership or caring for the environment).   The work on boundary roughness (Stamps 111 & Krishnan 2006) suggests that complexity adds to a sense of spaciousness in the workplace; their complexity, however was confined to the walls (in terms of shelving, both empty and filled with books), while the messiness that respondents reported was heaps of papers, boxes and other miscellany on office floors (with particular reference to Case Study 1). This links to the finding that the amount of floor area available in the workplace is a key environmental factor for increased job satisfaction (Brill et al 1984).

Physical Movement

> Typical activities that facilitate subconscious creative processes are walking, showering, swimming, driving, gardening, weaving and carpentry (Csikszentmihalyi 1996: 354)

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[33] The model of emotion or affect used by Franz comprises three main dimensions: valence (pleasure, beauty, comfort), arousal (interest, excitement) and dominance (experienced control) (Russell & Snodgrass, 1987).

> Movement is, so to speak, living architecture - living in the sense of changing emplacements as well as changing cohesion. This architecture is created by human movements and is made up of pathways tracing shapes in space, and these we may call "trace-forms". A building can hold together only if its parts have definite proportions which provide a certain balance in the midst of the continual vibrations and movements taking place in the material of which it is constructed. The structure of a building must endure shocks from alien sources, for instance, by the passing traffic, or by the jumping of lively inhabitants. The living architecture composed of the trace-forms of human movement has to endure other disequilibrating influences as they come from within the structure itself and not from without (Laban 1966: 5)

The kinaesthetic senses emerge from the research data of this study as saturated categories concerning the relationship between creativity and movement on a sensory level. There is a wealth of anecdotal material in this area, from St Augustine's Latin phrase *solvitur ambulando* (it is solved by walking) to Salk's walk round a mediaeval cloister that sparked his thinking about the polio vaccine (and his subsequent collaboration with the architect Louis Kahn to design the iconic Salk Institute). Steiner (1916) posited that the perception of movement and mobility is mediated in the unconscious, as is our sense of balance. Two key texts dealing with the kinaesthetic senses examine, firstly, the role of walking in poets' composition of verse (Beatty & Ball 2011) and secondly, the sustained effect of aerobic exercise on everyday creativity (Blanchette, Ramocki, O'del & Casey, 2005). Although Space Syntax (Hillier & Hanson, 1984; Hillier 1996) examines the movement of people within spaces from the perspective of interactions and communication between them (Sailer, 2007), this is less to do with the senses and more to do with a construct of grammar. It is therefore examined in the literature of grammars, Chapter 2, page 36.

Explanations of the effect of movement, particularly walking, on creativity include physiological arousal, psychological self-esteem or efficacy (Blanchette, Ramocki, O'del & Casey, 2005) and the cognitive where the distraction of the act of walking leads to a diffuse cognitive processing of input (Beatty & Ball 2011) and resultant creative associations (Koestler 1964; Osborn 1953). This latter resonates closely with Steiner's classification of movement as a sense mediated by the unconscious.

In the grammar of creative workplaces physical movement appears in both the syntax and the lexis, but predominantly in the former.

Aliveness

In this study, *aliveness* is made up of the Steinerian senses of *speech, thinking, life (feeling alive)* and *the I (ego)*. Aliveness is where this study began, with Alexander's injunction to create built environments where people can discover the 'situations when we are most alive' (Alexander 1979: x). The sense of aliveness presents in the first literature review where the traits of the creative person are discussed. As seen earlier, aliveness links particularly into Csikszentmihalyi's work on flow where, 'because it reaffirms the order of the self and is so enjoyable, people will attempt to replicate it whenever possible' (Csikszentmihalyi 1988: 34). The Steinerian senses of speech and thinking are present in the data as elements of the engage/disengage model of creative behaviours. Data that emerges from all three research stages include the sense of speech, of communicating with colleagues and with oneself internally. Fayard & Weeks (2011) emphasise the importance for creativity in the workplace of being able to talk without being overheard; theories of propinquity in the work of Allen (1977) and Allen & Gerstberger (1973), on the other hand, suggest that more confined spaces result in more informal meetings and hence better communication. The work of Brill et al supports Fayard & Weeks' perspective on speech, and also looks at what kind of environment is most likely to support the sense of thinking:

> Finally, workspace design can have a profound impact. Workers in acoustically private workspaces— however small—are more productive than their peers in open offices, are better team players, participate more productively in meetings and useful informal interactions, complete more focused work, learn more from others and communicate better with co-workers. They are also more satisfied with their jobs. (Brill et al 2001)

The final aspect of aliveness is the sense of ego or *the I*. In his 1916 lecture Steiner talked of *the sense of the I* as a way of perceiving others, of 'meeting other people who reveal their I to us. Perception of the other person's I, not of our own, that is the function of the sense of the I' (Steiner 1916). Respondents in the present study adapted their workplace not only to suit their own needs, but to create a self-image of who they are and what they are working on that can be shared with colleagues; in Steinerian terms, revealing their *I* to themselves and to others. Work environments where they were unable to do so were viewed negatively. A key text in this area is McCoy (2000) whose in-depth case study of a US government department finds that teams 'display symbolic artefacts unique to the team as a means of self-expression. Higher levels of creativity are associated with the teams whose range of activities includes [making

changes to] their professional domain and artefacts that reflect those professional activities' (2000: 251); and that 'team members [...] participate in the design of their environments in order to fit team requirements with the physical environment' (McCoy 2000: 256). McCoy quotes the International Workplace Studies Program (IWSP) where the finding that 'the physical environment must reflect the team's sense of identify' (in McCoy 2000: 180) is one of six interdependent criteria, key to how the work environment might best support successful companies. This need for individualisation is also a key part of Barrett & Barrett's three-part model (2010) for sensory-based space design. Here it is seen in two ways: particularisation in which, as in McCoy's (2000) case study, people craft their workplace to their particular needs, and personalisation, where preferences are dictated by personal life experiences, and mediated by memory. Memory is partially situated, that is: emotions are linked to the spaces where events happened, so the connection between experience and spaces is an important element of emotion (Barrett & Barrett 2010: 224). The positive effects of individualisation are studied by Killeen et al (2007) looking at permanent display of pupil artwork in a school, where pupils had been instrumental in both the production and the choice. It was found that the sense of ownership of a space increased motivation, engagement and creativity levels. Finally Brill et al (1984; 1987) bring forward the need to display personal artefacts, and to participate in the process of designing their environment, as identified factors supporting productivity and motivation.

Thus, there is a wide-ranging and comprehensive literature on the impact that the senses have on people's ability to stimulate, sustain and support their workplace creativity. This literature informs the research findings on the properties of physical press that support creativity in the workplace.

Appendix 17:   Grammar component test: sample focus group cards

I need to be able to:

Cycle

Sample Behaviours card

PLACE

OUTSIDE THE WORKPLACE

Home: Dedicated home office

Sample Place card

CHARACTERISTICS

Subdued/dim light
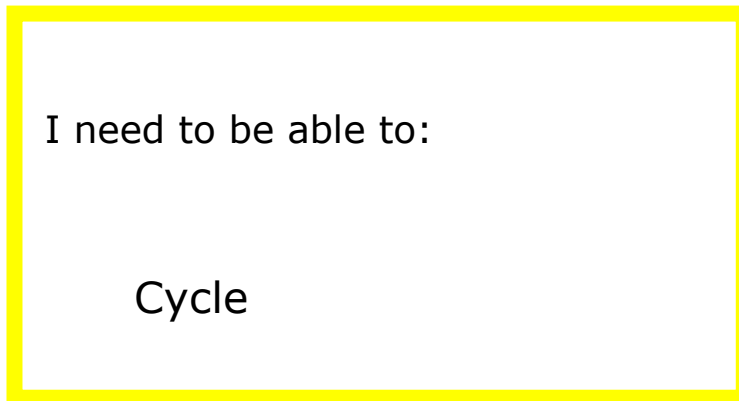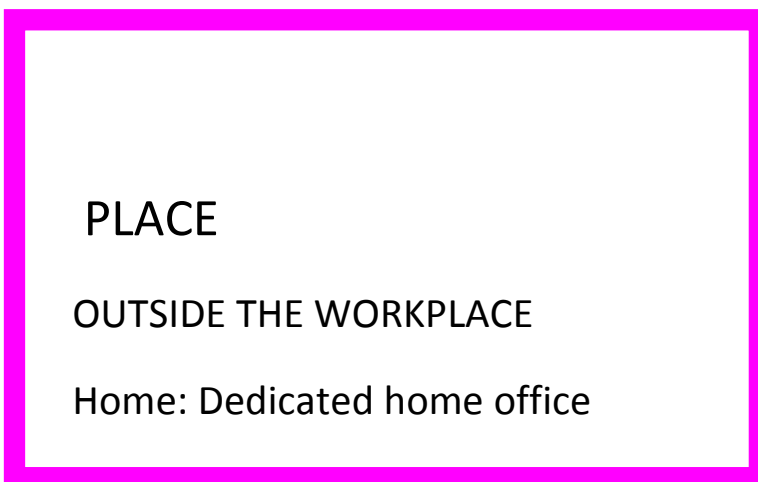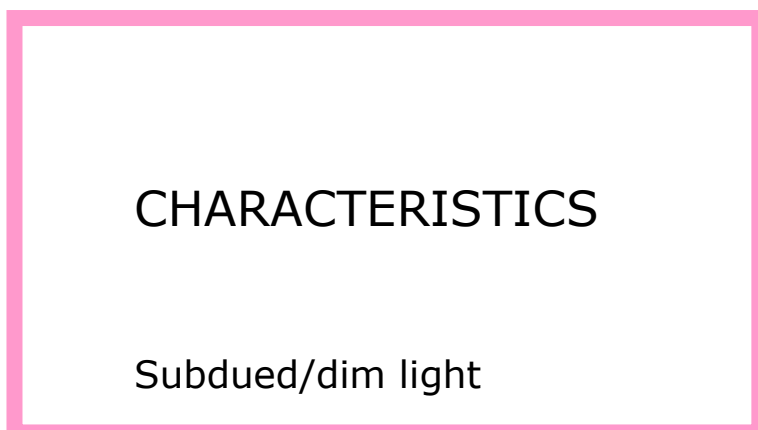
Sample Properties card

Appendix 18: Grammar component test: focus group data analysis

FG member	PLACE	PROPERTIES	AFFORDANCES
1 +PPT	Outside (Countryside & built-up) by the sea balcony garden rooftop park (moving/walking) park (seated) square (moving/walking) square (seated) street (moving/walking) street (seated)	Fresh natural smell Fresh perfumed smell Strong colours Buzzy atmosphere Cool Strong colours Buzzy atmosphere Cool Bright light Bright colours Natural light Natural colours Subdued/dim light Subdued colours Long line-of-sight Short line-of-sight Views Enclosed Neutral/no smell Noisy	I need to be able to: Make my thinking visible to other people – face-to-face Make my thinking visible – draw/doodle/scribble-think What else..............? What else..............?

		Quiet Silence Music (headphones) Music (broadcast)	
2	by the sea on cliff-tops mountains informal home office studio (visual arts) studio (film and new media) park (moving/walking) square (moving/walking) street (moving/walking) rooftop square (seated) *Only if I have something to write on usually* living room – *dining room table* Art gallery/art space bathroom/shower cafe – *lots of people around* sleeping place – *1) wake up 2) Make coffee 3) drink coffee & think for 30 mins before getting up*	no-one else around a few people around – *or a lot*	when I'm driving (in America – wide open spaces and desert) I need to be able to make my thinking visible to other people electronically I need to be able to make my thinking visible draw/doodle/scribble-think I need to be able to share my thinking with others: *in cafe/bar/over breakfast* I need to be able to: - do lots of wide reading - Bump in to people I know *If I'm writing, I <u>have</u> to be reading also for writing for performance* I can think well when: I'm on a train *through countryside like between Lake District and Glasgow, or Newcastle and Edinburgh*

| 3 | *I guess I don't have distinct choices among cards (spaces). (I guess I don't have much choices, but also I zoom into the zone. Place doesn't really matter unless you <u>need</u> a <u>tool</u> for making stuff)* | | *Just not to worry about thirst...*
I need to be able to get myself a drink of water *or bring one next to you*
so....
I need to be able to make myself a tea or coffee whenever I want a break.
Connection is important to me –
I need to be able to connect with the unexpected
I need to be able to connect with new ideas.
DREAM HELPS
Weird. I feel creative when I'm in sleep. I have a sense of controlling what I see in my dream. In the morning, if I don't write down the sense is gone quickly.
I love movement.
I feel so creative. So...
I need to be able to move around
sometimes
I can think really well when I'm on a train
everyday
I need to be able to cycle
it helps me move
rare, but sometimes
I need to be able to go running
I need to be able to go jogging
Is it different? |
| 4 +PPT | *PROCESS*
art gallery/art space
museum
informal home office | *PROCESS* | *PROCESS*
I need to able to connect with new ideas
I need to be able to do lots of wide reading
I need to be able to connect with the unexpected |

	library bathroom/shower sleeping space cafe *PRODUCT/PRODUCE/SPACE BETWEEN* *FLOW/DISCONNECT/DAYDREAM* Mountains Hills by the sea by a lake beside a stream studio (music and sound) Park (moving/walking) street (moving/walking) park (seated) square (seated) beside a river or a canal [NB: this person had two different needs – for personal art working, and for working with others in formal/informal collaboration.	Quiet *PRODUCT/PRODUCE/SPACE* *BETWEEN* *FLOW/DISCONNECT/DAYDREAM* Warm breeze windy views long line of sight cool natural light	*PRODUCT/PRODUCE/SPACE BETWEEN* *FLOW/DISCONNECT/DAYDREAM* I need to be able to go swimming I can really think well when I'm on a bus ...on a train *I need to be able to hear my thinking*
4 work	Studio (visual arts) Privacy space Informal meeting space	Fresh natural smell Neutral/no smell Music (broadcast)	Tea or coffee when I want a break Get a drink of water Share my thinking with others – *discussion,*

	Large meeting room Shared office (up to 8 people) Canteen/work cafe	Subdued Colours Neutral colours	*sounding*
5	*1. ART RESEARCH* art gallery/art space bathroom/shower living room informal home office garden park (moving/walking) street (moving/walking)	*1. ART RESEARCH* silence calm neutral colours comfort	*1. ART RESEARCH* go for a walk get myself a drink of water do my preferred exercise activity [Overlap with Art research:] go for a walk connect with new ideas connect with the unexpected *eventually:* share my thinking with others *by talking*
	2.TEACHING (RESEARCH) Single person office TIME of day/night in which people are most creative?	*2.TEACHING (RESEARCH)* natural light neutral/no smell quiet warm	*2.TEACHING (RESEARCH)* I need to be able to: make myself a tea or coffee whenever I want do lots of wide reading use my laptop [Overlap with Art research:] go for a walk connect with new ideas connect with the unexpected *eventually:* share my thinking with others *by talking* *When overloaded: I need to be able to disconnect in order to connect again after being*

			neutrally/creatively involved e.g after supervision session
6	PPT only		
7	PPT only		
8 +PPT	CORE Informal home office cafe living room sleeping space informal meeting space studio (film & new media) park (seated)	CORE Views Music (broadcast) calm comfort	CORE go for a walk move around easily access information
	GENERATE PHASE	GENERATE PHASE enclosed/fresh natural smell still air/warm neutral-no small/natural light discomfort buzzy atmosphere	GENERATE PHASE get a drink of water tea or coffee whenever I want a break on a bus cycle connect with the unexpected
	DEVELOP PHASE	DEVELOP PHASE	DEVELOP PHASE I'm on a train do household chores
	REFINE PHASE	REFINE PHASE	REFINE PHASE share my thinking with others discussing over coffee
9 +PPT	privacy space	noisy music (broadcast_ subdued/dim light natural light views	make my thinking visible:electronic/html make my thinking visible: face-to-face make my thinking visible: draw/doodle/ scribble-think bump in to people I know move around

			lots of wide reading tea or coffee on a train
10 +PPT	privacy space	views neutral/no smell cool breeze views calm silence	make my thinking visible: face-to-face make my thinking visible: draw/doodle/ scribble-think bump in to people I know move around lots of wide reading tea or coffee on a train connect with new ideas
11	*PLACE OF WORK - ABSOLUTES* by the sea hills beside a river or canal farmland garden *PERSONAL PREFERRED WORKING* *CONDITIONS FOR MOST CIRCUMSTANCES*	*PLACE OF WORK – ABSOLUTES* long line-of-sight views fresh natural smell *PERSONAL PREFERRED WORKING* *CONDITIONS FOR MOST* *CIRCUMSTANCES* Enclosed neutral/no smell warm strong colours quiet small calm	*PLACE OF WORK – ABSOLUTES* tea or coffee do preferred exercise activities connect with the unexpected make my thinking visible – draw/doodle/ scribble-think share my thinking with others *PERSONAL PREFERRED WORKING CONDITIONS* *FOR MOST CIRCUMSTANCES*

	GENERATE restaurant other dedicated home office cafe DEVELOP shared office <8 people small meeting room informal meeting space large meeting room REFINE shared office <8 people studio (visual arts) *A MOMENT OF OUTCOME*	bright light comfort bright colours short line-of-sight GENERATE DEVELOP REFINE *A MOMENT OF OUTCOME* Natural light neutral colours subdued colours buzzy atmosphere lots of people around music (broadcast)	GENERATE connect with new ideas meet new unexpected people on a train DEVELOP visible thinking via electronics visible thinking via face2face lots of wide reading bump into people I know REFINE driving move around *A MOMENT OF OUTCOME*

Appendix 19: V1.0 of the grammar of creative workplaces

PLACES	Yes	No	How many of this kind of space?	Core	Ancillary	Area number	Description and comments
Official workplace/ workstation							
Laboratory							
Open plan office 50-100							
Open-plan office 9-50							
Shared office < 9							
Single person office							
Studio							
Other site-specific area							
Other							
Semi-official workspaces							Do people have to move outside the core area to get to these? How far?
Small meeting rooms							
Large meeting rooms							
Informal meeting areas							
Canteen/work cafe							
Office kitchen spaces							

Chill-out areas							
Other							

Informal spaces at work (created/ found by staff)	Yes	No	How many of this kind of space?	Core	Ancillary	Area number	Do people have to move outside the core area to get to these? How far?
Privacy space							
Corridors							
Coffee/vending machine							
Water cooler							
Staircase							
Communal area							
Shower room							
Smokers' corner							
Washrooms							
Headphone space							
Virtual space							
Other							
Outside work (observed)							
Domestic space							
Public space							
Commercial space							
Other							

Properties

	Description	Core	Ancillary	Number	Assessed quality 1-5 (5 high)	Impressions and comments
Taste & smell	Are you aware of any unpleasant smell?					
	Any pleasant smell?					
	How good is the food?					
Touch	How comfortable are the chairs? Desk height? Sofas? Other?					
	What kind of material is used for the furniture? Does it feel good?					
Tempera-ture	Is there a good working temperature for a) sitting? b) moving around?					
Air quality	Fresh?					
	Stale?					
	Drafty?					
Sight	Views onto nature					
	Views onto buildings					
	Natural light (amount)					
	Colours - bright? Muted?					
	Red/yellow spectrum?					
		Core	Ancillary	Area #	Assessed quality 1-5 (5 high)	Impressions and comments

	Blue/green spectrum?				
	Degree of messiness/order				
Sound	Quiet buzz				
	Distractingly loud/noisy				
	Silence				
Spacious-ness	Long line-of-sight inside				
	Ceiling height - high/low				
Balance/ acceler-ation	Non-linear spaces to move around in (eg curved corridors)				
Proprio-ception	Plenty of spaces for walking/moving about inside the building				
Speech	Sense that people can speak freely with each other				
Thinking	Sense that the space encourages people to work on their own without interruption				
Life	Sense of liveliness in the space - laughter, smiles, enjoyment				
The I (ego)	individual and personal work spaces are personalised with displays, objects, plants etc				

ACTIVITIES [behaviours]		Core	Ancillary	Area Number	Impressions and comments
Could a person or team ENGAGE with people, information and ideas deliberately and by chance in this space?					
DELIBERATELY engage with people	Easy access to colleagues physically - conversation, speaking, cross-discipline				
	Easy access to colleagues electronically - what programmes/equipment are being used				
DELIBERATELY engage with information	Easy access to information physically (displays, books, journals)				
	Easy access to information electronically: what progs/equipment are being used				
DELIBERATELY engage with ideas	What space (e.g. workshops) is there for experimentation, play, trying things out, crafting, reviewing				
	Seminars held for sharing ideas and info				
CHANCE engagement with people	Areas where people can encounter each other by chance (e.g. canteen, corridors, water cooler)				

CHANCE engagement with information	Ways of engaging or encountering information randomly, by chance - displays, unexpected journals, electronic etc				
Could a person or team DISENGAGE from their surroundings/other people in this space using the following mechanisms?					
Physical movement	Are there opportunities for short walks inside or outside the building (to kitchen, photocopier etc.)				
	Are there spaces that support longer physical activities (jogging, swimming, runnning, walking etc) Are there showers? Running tracks? Pool? Gym? cycle racks etc?				
Mechanical movement	Is there easy access to transport?				
Daydream & reflection	Are there private, quiet places where people can go to think and reflect on their own?				
Think, write, generate ideas	Are there private, quiet places where people can go to work on their own?				
	Any further activity spaces that you have noticed?				

AFFORDANCES		Core	Ancillary	Area No.	Comments & description
What affordances does the space contain for helping people to ENGAGE with others, information and ideas					
DELIBERATELY engage with **people**	Whiteboards, writing walls, multi-touch tables, flip charts, informal meeting spaces, chairs and sofas? Meeting rooms **without** central tables?				
	Electronic programmes and equipment				
DELIBERATELY engage with **information**	Display stands and screens, bookcases, magazine and journals racks, other				
	Electronic programmes and equipment				
DELIBERATELY engage with **ideas**	What affordances are there for play, experimentation, trying things out, crafting, reviewing				
	What affordances are there to make people's ideas physically visible to others				
CHANCE engagement with **people**	What affordances are there for randomly encountering other people, from outside as well as inside the organisation?				
CHANCE engagement with **information**	What affordances are there for engaging or encountering information randomly, by chance?				

CHANCE engagement with **ideas**	What affordances are there (physical and technological) for serendipitous encounters with ideas?				
What affordances does the space contain for helping people to DISENGAGE from others?					
Physical movement	Are there 'excuses' for short walks inside the building (eg to kitchen, printer, photocopier etc.)				
	What affordances are there for physical activities -- Showers? Running tracks? Pool? Gym? Cycle racks etc?				
Mechanical movement	What affordances are there for travel? Eg car parks, good bus and train access				
Daydream & reflection	What affordances are there for people to think and reflect on their own?				
Think, write, generate ideas	What affordances are there for people to work on their own?				
	Any further affordances that you have noticed?				

Appendix 20: Pilot Test 1 correspondence between grammar and interview data: HI Building

PROPERTIES

Comfort	Grammar assessment	Interviewee assessment	Score 0-5
Taste/ smell	No score: very neutral	No mention	0
Touch	Chairs comfortable but not too relaxing	Interviewee 1: "I quite like this chair [...] It is comfortable to sit for a long time."	3
Temper-ature	Good for working at desk	No mention	0
Air quality	Very dry, de-energising	No mention	0
TOTAL			3

Comfort: correspondence between grammar and interviewee data (HI)

Sight	Grammar assessment	Interviewee assessment	Score 0-5
Views/ nature Views/ built	No views	Both want link to the outside: Interviewee 1: "Window would be nice; it is one of the important elements" Interviewee 2: "I would like to have windows so that the space can connect to the exterior" "[Window] is good so you can feel it is not just limited space"	5
Natural light	No light from outside. Very depressing environment	No mention – scored by implication with wish for link to outside	5
Colours	Grey [used prejoratively]	Interviewee 1: "I want a warm colour, so if we can have a colourful wall – I think the colour is important for me. So it's not just one colour"	3
Orderli-ness/ Mess	Very clinical and ordered	No mention	0
TOTAL			13

Sight: correspondence between grammar and interviewee data (HI)

PROPERTIES (continued)

Sound	Grammar assessment	Interviewee assessment	Score 0-5
	Very quiet	Interviewee 1: "The cubicle works for me, if I want to have private space to work" Interviewee 1: "You would not be disturbed by others"	4
TOTAL			4

Sound: correspondence between grammar and interviewee data (HI)

Spacious -ness	Grammar assessment	Interviewee assessment	Score 0-5
	No long line-of-sight	Interviewee 1: "It is kind of like a semi-open space so when you want to concentrate on your work you have some walls to separate you from others" Interviewee 2: "[I would like to] lower down the cubicle walls to like [2ft] [...] so no longer this high [4ft]"	5
	Average ceiling height	No mention	0
TOTAL			5

Spaciousness: correspondence between grammar and interviewee data (HI)

Movement	Grammar assessment	Interviewee assessment	Score 0-5
	Plenty of space for movement but within corridors	Interviewee 1: "I walk down the street" Interviewee 2: "I just walk around the floor two or three times and then go back"	4
TOTAL			4

Movement: correspondence between grammar and interviewee data (AS)

PROPERTIES (continued)

Aliveness	Grammar assessment	Interviewee assessment	Score 0-5
Speech	Very quiet – intimidating – not conducive for chatter	Interviewee 1: "Easy to have a chat with my colleagues" Interviewee 2: "If I want to have discussion – if I want to have some talk with some people […] I feel like I am restricted to the cubicle."	2
Thinking	Yes, quiet independent study space	Interviewee 1: "It's more concentrate to write a paper in a small cubicle" Interviewee 2: "I am immersed in my own thinking"	5
Life	No life, no laughter, no fun	Interviewee 1: "The space [of colleague in end cubicle] is not that boring – sometimes there is a surprise over there, and it's like a stimulus"	1
The I (ego)	Very little personal possession of the space, few artefacts	Interviewee 1: "Sometimes she [colleague in end cubicle] will use some cute notepad or a cute drawing" "People's working space – they like to make it work for them because information around them so that they can find it just by […] scanning"	1
TOTAL			9

Aliveness: correspondence between grammar and interviewee data (HI)

Properties	Overall score	Highest possible correspondence	Accuracy %	Accuracy level
Comfort	3	20	15%	LOW
Sight	13	20	65%	MEDIUM
Sound	4	5	80%	HIGH
Spaciousness	5	10	100%	HIGH
Movement	4	5	80%	HIGH
Aliveness	9	20	45%	LOW
TOTALS	**38**	**80**	**47%**	**LOW**

Properties: overall correspondence between grammar and interviewee data (HI)

BEHAVIOURS

Behaviour	Grammar assessment	Interviewee assessment	Score 0-5
ENGAGE			
Engage deliberately with people	Yes, potential for engagement with others	Interviewee 1: "Most of our projects are not alone so we have to work with our colleagues and it's an open space." "So people can just come to my desk and we can just discuss the project on my laptop and then we can work for a while over my desk, and we could just drag another empty chair and sit together and have a longer chat or discussion" Interviewee 2: "One of the motivations to be creative is to talk to others in an office" "I think part of creativity is about discussion." "The cubicle is for [conversation with one other person]" "Sometimes you can just go out of your cubicle and talk to the people just next to you." "I think that is helpful so it is easy to go back to my own world and think about my own project or work and it's easy to have a chat with my colleagues" "[I would like to be] able to look over [the cubicle walls] to talk"	5
Engage by chance	Chance encounters possible in kitchen along the corridor	Interviewee 1: " We may run into each other in a small space and could have some chat during lunch, or some snack time " Interviewee 2: "Just a very casual talk"	5
Engage with ideas and information	Very little visible information. Books in room adjacent. Some posters but very little other visual matter in the space No communal space; however there is a white board at the end of the room and academic posters position at the other end high up on the wall. Little likely stimulation	Interviewee 1: "[Fellow student's] space is not that boring – sometimes there is a surprise over there, and it's like a stimulus".	4
TOTAL			14

Engage: correspondence between grammar and interviewee data (HI)

BEHAVIOURS (continued)

DISENGAGE

Physical movement	Extensive corridor system	Interviewee 1: "[I get an idea] when I walk down the street. I think in those moments I talk to myself. It's like in a conversation with myself. I think that's a good way to have those ah-ha moments" Interviewee 2: "You have to walk to see others" "[I get good ideas] when I am walking. I think walking is good if I am stuck in one place, I just walk around the floor two or three times and then go back. So I think walking is very helpful." [the corridors form a square] "[The walk] clears my mind" "There are two kinds of problems. The first kind of problem is, you know that's the goal. And there is a path towards it. And walking is better for solving this kind of problem"	5
Mechanical movement	Affordances for travel immediately outside the building	Interviewee 2: " [I get good ideas] driving – like when I take the train" "The second kind of problem is open question problem, and it more like there are two or three possibilities to get to the goal but you do not know which one is better. When you do this, moving or driving is freeing my mind for dealing with the second kind of problem"	3
Daydream & reflection	The workstations could be private quiet places as they are individual cubicles – it is <u>very</u> quiet. [...] potentially good space for quiet reflection	Interviewee 1: "[Getting an idea] happens when I am alone. So if I am immersed in my own thinking" "[Getting an idea happens] when I walk down the street. I think in those moments I talk to myself. It's like in a conversation with myself. I think that's a good way to have those ah-ha moments" Interviewee 2: "Sometimes you can focus on one something for a long time if your mind will be restricted so you are [not] able to scan for all the possibilities and also the creativity path" "I feel like I am restricted to the cubicle"	4
Think, write, generate ideas	Yes, each workspace is potentially a workspace for individual work on a computer – clean space/work Highly structured towards individual quiet working spaces facilitated by technology	Interviewee 1: "I think that is helpful so it is easy to go back to my own world and think about my own project or work and it's easy to have a chat with my colleagues" "I am here almost every day as long as I don't have class. Sometime I will come here during the weekend. [...]I feel it is easier to concentrate in the workspace instead of at home. [...] I can focus on my own task" Interviewee 2: "Sometimes the cubicle works for me if I want to have private space to work" "When you want to concentrate on your work you have some walls to separate you from others."	5
TOTAL			17

Disengage: correspondence between grammar and interviewee data (HI)

AFFORDANCES

Engage

Engage deliberately with others	Poor: One whiteboard/flip chart at the end of the central corridor	Interviewee 2: "Sometimes the cubicle works for me [...] but [not] if I want to have discussion, if I want to talk with some people"	3
Engage by chance with others	Little People walking to and from their individual work cubicles [*Low correspondence due to there being no notices of talks etc in the space assessed*]	Interviewee 1: "Sometimes a lot of speech or talk going on around the campus. Sometimes [the professor] will know the speakers and will invite them to our lab to give a short talk or we could talk with visitors about our projects. And we have exchange students from Holland, or from Finland or from Sweden. So there are outside students who bring a different perspective to our lab as well."	2
Engage with information deliberately	No	Interviewee 1: "Probably you could start a conversation, start with that cue [of notes pinned up]"	2
Engage by chance with information & ideas	Conversations within the space with other workers is potentially possible, though few people present at time of survey (only 2). No visual stimuli	Interviewee 1: " We may run into each other in a small space and could have some chat during lunch, or some snack time " Interviewee 2: "Just a very casual talk"	4
Engagement with ideas by play, experiment-ing etc.	Only virtual [*Issue of IA reluctance to explore the space fully, thus missing the two 'stimulating' cubicles*]	Interviewee 1: "Sometimes [colleagues] just have a note in front of their desk and sometimes the notes are pretty interesting. For example the girl I just waved to, she has some notes about her research in front of her desk. [...] The space is not that boring – sometimes there is a surprise over there, and it's like a stimulus. Probably you could start a conversation, start with that cue."	1
Making ideas visible	Flip chart/whiteboard only [*Issue of IA reluctance to explore the space fully, thus missing the two 'stimulating' cubicles*]	Interviewee 1: "And sometimes she will use some cute notepad or a cute drawing, and those are lovely. I think those are – you will see it – not sure how to describe the feelings, but you will have a kind of surprise"	1
Total			13

Affordances engage: correspondence between grammar and interviewee data (HI)

AFFORDANCES (continued)

Disengage

Physical movement	Yes – excuses for short walks inside building	Interviewee 1: [Getting an idea] when I walk down the street. I think in those moments I talk to myself. It's like in a conversation with myself. I think that's a good way to have those ah-ha moments	4
Mechanical movement	Yes	Interviewee 2: [I get good ideas] driving – like when I take the train The second kind of problem is open question problem, and it more like there are two or three possibilities to get to the goal but you do not know which one is better. When you do this, moving or driving is freeing my mind for dealing with the second kind of problem.	3
Daydream & reflect	Very quiet so potentially good space for quiet reflection	Interviewee 1: [Getting an idea] happens when I am alone. So if I am immersed in my own thinking Interviewee 2: Your mind will be restricted so you are [not] able to scan for all the possibilities and also the creativity path	5
Think, write, generate ideas solo	Highly structured towards individual quiet working spaces facilitated by technology	Interviewee 1: We can come back to our own cubicle and do our own work. Sometimes I find out it's more concentrate to write a paper in a small cubicle because you don't have some other interruption from outside world – you just see the wall and the monitor and so......I think that is a good way for me to concentrate. Interviewee 2: Sometimes the cubicle works for me if I want to have private space to work	5
TOTAL			17

Affordances disengage: correspondence between grammar and interviewee data (HI)

AFFORDANCES (continued)

Affordances	Overall score	Highest possible correspondence	Accuracy %	Accuracy level
Engage				
Engage deliberately with others	3	**5**	60%	MEDIUM
Engage by chance with others	2	**5**	40%	LOW
Engage with information deliberately	2	**5**	40%	LOW
Engage by chance with information	4	**5**	80%	HIGH
Engagement with ideas by play, experimenting etc.	1	**5**	20%	LOW
Making ideas visible	1	**5**	20%	LOW
Disengage				
Disengage by physical movement	4	**5**	80%	HIGH
Disengage by mechanical movement	3	**5**	60%	MEDIUM
Daydream & reflect	5	**5**	100%	HIGH
Think, write, generate ideas solo	5	**5**	100%	HIGH
TOTALS	**30**	**50**	**60%**	**MEDIUM**

Affordances: overall correspondence between grammar and interviewee data (HI)

SUMMARY OF CORRESPONDENCE BETWEEN GRAMMAR AND INTERVIEW DATA IN HEALTH INSTITUTE

Grammar element (HI)	Overall correspondence score	Highest possible correspondence	Accuracy %	Accuracy level
Properties	38	**80**	47%	LOW
Behaviours	29	**35**	83%	HIGH
Affordances	30	**50**	60%	MEDIUM
TOTAL	**97**	**165**	**58%**	**LOW**

HI workplace: correspondence between grammar and interviewee data

Appendix 21: Pilot Test 2 correspondence between grammar and interview data: Architectural Studio

PROPERTIES

Comfort	Grammar assessment	Interviewee assessment	Score 0-5
Taste/ smell	Some coffee smell in the main studio	The other building has a coffee cart, so you go down and get a cup of coffee and take a break and I think that is kind of lacking in this space.	2
Touch	No mention of touch	At first this space took some getting used to [...], first coming in here it was hard, it was so... you have this light plywood, and concrete and that was it	0
Temper-ature	Wearing short [sleeved] shirt is comfortable in the space	No mention	0
Air quality	It's not a fresh air but not draughty as well	No mention	0
TOTAL			2

Comfort: correspondence between grammar and interviewee data (AS)

Sight	Grammar assessment	Interviewee assessment	Score 0-5
Views/ nature Views/ built	None onto nature – one huge window that can access to buildings	No mention	0
Natural light	Natural light – large window on about 12m height of one side of wall	North facing with great light I feel like it is the incredible lightness of the Hammock	5
Colours	Bright Light yellow	It is finally feeling more warm [...] visually warm	5
Orderli-ness/ Mess	No mention	Everyone's desk was cluttered with work going on [...] here we have some people who have a blank slate whereas I have obviously moved in [gestures towards her clutter space].	0
TOTAL			10

Sight: correspondence between grammar and interviewee data (PT1)

Sound	Grammar assessment	Interviewee assessment	Score 0-5
	Some talking in the space but not loud	It is loud in here	1
TOTAL			1

Sound: correspondence between grammar and interviewee data (AS)

PROPERTIES (continued)

Spacious-ness	Grammar assessment	Interviewee assessment	Score 0-5
	Yes – line of sight	We have this amazing centre place which is really nice for, like, having a studio	4
	High ceiling height – about 12 metres	No mention	0
TOTAL			4

Spaciousness: correspondence between grammar and interviewee data (AS)

Movement	Grammar assessment	Interviewee assessment	Score 0-5
	Yes – there are about 5 rows of desks, people can walk and talk	People that go through this wing Like you are going from that studio over there [points to 2nd floor studios] to the studio downstairs.	5
TOTAL			5

Movement: correspondence between grammar and interviewee data (AS)

Aliveness	Grammar assessment	Interviewee assessment	Score 0-5
Speech	Yes – there are about 5 rows of desks, people can walk and talk	People can come by and there is like this community sense	4
Thinking	There are probably many interruptions in the space	I will be sitting here and I will be like intensely working on something and then, like "Oh Emily!" [an interruption] and I am like off on a 45 min tangent.	5
Life	People are seriously working and talking	[It is good when we are] in here and to collaborate when we are up all night together...this entire hammock, it is occupied by us working.	5
The I (ego)	Personalised by a section of table	This space has given me an opportunity where you claim part of the space and make it your second home so you become - it is giving you this very generic baseline where you can make your own individual person.

The panels [points to corner where pin-up space is] – they don't fit any of the elevators, and we had to roll them from the main building and one fell on my face and it was kind of funny, and we had to carry them up that stair too and they are kind of heavy. | 5 |
| TOTAL | | | 19 |

Aliveness: correspondence between grammar and interviewee data (AS)

Properties	Overall score	Highest possible correspondence	Accuracy %	Accuracy level
Comfort	2	20	10%	LOW
Sight	10	20	50%	LOW
Sound	1	5	20%	LOW
Spaciousness	4	10	40%	LOW
Movement	5	5	100%	HIGH
Aliveness	19	20	95%	HIGH
TOTALS	**41**	**80**	**51%**	**LOW**

Properties: overall correspondence between grammar and interviewee data (AS)

BEHAVIOURS

Behaviour	Grammar assessment	Interviewee assessment	Score 0-5
ENGAGE			
Engage deliberately with people	Should be easy Many people are talking either for projects or casually People talking and discussing their project	People can come by and there is like this community sense People that go through this wing [from the side balcony 2nd floor to the main studio first floor].	5
Engage by chance	Many activity in action Many people talking at the moment	But what is really interesting is the days when it is a bit more quiet, like Tuesdays and Thursdays when you are just working, to see all these special classes like the watercolour and other classes that take up these other spaces- seeing different bits of work Hearing what the other professor talks like, hearing what they do [...] extend[s] the creative process.	5
Engage with ideas and information	No books or shelves in their own space Large desks, open desks for making models, softwood wall for pinning posters No seminars held at the moment Chance encounters at "two ends of the desks, corridors"	We have pin-ups and assignments every week.	4
TOTAL			14

Engage: correspondence between grammar and interviewee data (AS)

DISENGAGE

Physical movement	Yes, inside of building – corridors, to kitchen, to printing	[It is] better to have two buildings so you might have to go outside and experience it. Because there is something about taking a step outside and "Cool, the sun's out!"	4
	They are walking and seem to have [...] targets	The new Starbuck in the building up there [CFY] so you have to leave the building. [...] Which is a nice thing, it is nice to force you to go outside your building	
Mechanical movement	Needs to walk for 10 minutes [to bus]	No mention	0
Daydream & reflection	"No"	You can choose to close yourself in	0
Think, write, generate ideas	"No"	I like to have that mental, that physical separation. I know when I'm in the studio I'm doing work. I'm also around creative people so if I have a problem I can talk to my peers	0
TOTAL			4

Disengage: correspondence between grammar and interviewee data (AS)

Behaviours	Overall score	Highest possible correspondence	Accuracy %	Accuracy level
Engage deliberately with people	5	**5**	100%	HIGH
Engage by chance	5	**5**	100%	HIGH
With ideas & information	4	**5**	80%	HIGH
Disengage By physical movement	4	**5**	80%	HIGH
Disengage by mechanical movement	0	**5**	0%	LOW
Disengage by daydream & reflection (+ work on own)	0	**5**	0%	LOW
Disengage to think, write, generate ideas (+ no interruptions)	0	**5**	0%	LOW
TOTALS	**18**	**35**	**51%**	**LOW**

Behaviours: overall correspondence between grammar and interviewee data (AS)

AFFORDANCES

Engage

Engage deliberately with others	Good	[Get ideas by] sitting up here talking	5
Engage by chance with others	People can walk by and talk to others	But I think that one of the things that is not only productive, but community in terms of the ambient productivity being around other people who are being productive, so that inspires you to keep doing good work.	5
Engage with information deliberately	A display stand Walls that can pin posters Many posters are pinned on the walls	That is another thing about having these spaces around so you – I make a point of saying like "Oh this class is having pin-up today, and going to see their work and see what other people are doing.	5
Engage by chance with information & ideas	No further information can be accessed besides their own project	Pin-up: Even if [seeing other's work] has nothing real aim to it, anything you are doing, it is nice to [do] [sic]	1
Engagement with ideas by play, experiment-ing etc.	Large tables for building models	You can see the creativity happening	4
Making ideas visible	People pinned their sketches and put the models on their own desks and walls Couple people are building models on the table	For me it is much more about how the space is getting used so you can see the creativity happening. When you have multiple people in here	4
Total			24

Affordances engage: correspondence between grammar and interviewee data (AS)

Disengage

Physical movement	Yes, the space is large and utility rooms are around them They [students] are walking with each other	You have to get up and run around [...] go downstairs [when the lights go off]	5
Mechanical movement	There is a parking lot just out of the building but it is for faculty Some cars are parked there	No mention	2
Daydream & reflect	No, they will interrupted with each other (sic)	I will be sitting here and I will be like intensely working on something and then, like "Oh!" [an interruption] and I am like off on a 45 min tangent.	5
Think, write, generate ideas solo	No, they will interrupted with each other (sic)	I will be sitting here and I will be like intensely working on something and then, like "Oh!" [an interruption] and I am like off on a 45 min tangent.	5
TOTAL			17

Affordances disengage: correspondence between grammar and interviewee data (AS)

Affordances	Overall score	Highest possible correspondence	Accuracy %	Accuracy level
Engage				
Engage deliberately with others	5	**5**	100%	HIGH
Engage by chance with others	5	**5**	100%	HIGH
Engage with information deliberately	5	**5**	100%	HIGH
Engage by chance with information	1	**5**	20%	LOW
Engagement with ideas by play, experimenting etc.	4	**5**	80%	HIGH
Making ideas visible	4	**5**	80%	HIGH
Disengage				
Disengage by physical movement	5	**5**	100%	HIGH
Disengage by mechanical movement	2	**5**	40%	LOW
Daydream & reflect	5	**5**	100%	HIGH
Think, write, generate ideas solo	5	**5**	100%	HIGH
TOTALS	**41**	**50**	**82%**	**HIGH**

Affordances: overall correspondence between grammar and interviewee data (AS)

SUMMARY OF CORRESPONDENCE BETWEEN GRAMMAR AND INTERVIEW DATA IN ARCHITECTURAL STUDIO

Grammar element (AS)	Overall correspondence score	Highest possible correspondence	Accuracy %	Accuracy level
Properties	41	80	51%	LOW
Behaviours	18	35	51%	LOW
Affordances	41	50	83%	HIGH
TOTAL	**102**	**165**	**62%**	**MEDIUM**

Architectural Studio: correspondence between grammar and interviewee data

PROPERTIES

Comfort	Grammar assessment	Interviewees' assessment	Correspondence Score 0-5
Taste/smell	Smell is fine. Air feels 'air conditioned' though	No mention	0
Touch	Workstations [...] modern, clean, nice round corners, new chairs, double screens for most	The tables are larger and everyone's been moved, and now my document controllers are much more room for them, they are happier at their desk area	4
Temperature	Temperature: It is warm, ideal if sitting all day. Probably a bit too warm if doing anything else	No mention	0
Air quality	Atmosphere quite stuffy (due to winter and heating on all day?)	No mention	0
TOTAL			4

Comfort: correspondence between grammar and interviewee data (MEC)

Sight	Grammar assessment	Interviewees' assessment	Correspondence Score 0-5
Views to the exterior environment	Only people in bottom 2 corner spaces have windows (would be good to start smoking!)	Where I'm sitting now I have a lovely big window. I can see the people come by and the traffic [No sense of the outside] Oh the sun! Oh, the snow! Yes, [...] some days it's a problem, and some days you don't notice it as much	5
Natural light	Virtually non-existent apart from areas above. Canteen has daylight.	I [would] like more sun light coming in. Where we are now the sun will come in for about 5 minutes and then it will go. Before I was just half in a shadow, often my own shadow. The benefit of daylight, or darkness if I'm here too long Q: Natural light? A: No, you have these 3 offices have all got windows with glass panels. But sometimes they shut the blinds if they have overhead projectors on so that [...] I went in in the morning and opened the blinds. No, you don't have any natural light. And we don't have natural daylight	5
Glare	Blinds on all windows to control glare	Someone had closed the blinds for a meeting last week	5
Artificial light	Adequate – typical office lighting done by	There are so many lighting variations in [the Business Excellence room] blues yellows green – different tones	5

			Correspondence

	Grammar assessment	Interviewees' assessment	Score 0-5
	calculation.	Now [the lighting is] more like natural light – a glow. They've changed all that round	
	Central pillar uplighting softens this but is overwhelmed by office lighting	It's a lot better now than what it was. It is something similar, but I think – I don't know what they did, but it's not as harsh as it used to be. It was a lot brighter – I don't know what they've done – diffusers? Plus we've got the lights that go off if there's no movement in an area. So it's not the first time I've been up on my own in the office because everyone else is away for a meeting and – bang! – the lights go off. The mood-enhancers are [points it out] on the columns – it is meant to generate more daylight – gets you in a better mood	
Colour spectrum (2)	Warm cream and updated so cheerful	[Coloured walls here – yellow-creamy] I think they're good. Just a bit different. It's bright	5
Orderliness/ Mess	General mixture desk to desk but feel is of a company that is very organised	[there's a] big drive on here to clean-desk policy. Now, as much as I think for H&S aspect of it, you've got to make sure that there is nothing lying about, no boxes lying in the areas. We need more storage in the office	4
TOTAL			29

Sight: correspondence between grammar and interviewee data (MEC)

			Correspondence
Sound	**Grammar assessment**	**Interviewees' assessment**	**Score 0-5**
Sound spectrum (2)	Quiet buzz at time of survey (7pm) Researcher: Quiet buzz throughout the interviews	If you go upstairs it is very very quiet. I prefer a buzz rather than complete silence. Sometimes if you go quiet, you can hear the dialogue on the other side through the walls. I've heard conference calls in the room next door and I can almost hear everything on the conference call, with people putting up the volume on the intercom to make sure they hear everything, but next door hears it too. I hated it at first when I moved up here because it was so quiet. Wherever you're at it does get noisy at certain times of the day	3
TOTAL			3

Sound: correspondence between grammar and interviewee data (MEC)

PROPERTIES (continued)

Spaciousness	Grammar assessment	Interviewees' assessment	Correspondence Score 0-5
Line-of-sight	Good line of sight across room (makes it seem sociable if want it to be)	The tables are larger and everyone's been moved, and now my document controllers are much more room for them, they are happier at their desk area If I see someone it triggers that I need to go and speak to that person, or a person from that department	5
Ceiling height	Ceiling height 2.4 is standard for domestic room not for a big long space	Because our spaces are not that big	3
TOTAL			8

Table 47: Spaciousness: correspondence between grammar and interviewee data (MEC)

Movement	Grammar assessment	Interviewees' assessment	Correspondence Score 0-5
Movement	There are defined route around core space and people have to walk to water/canteen/toilets	Stretch legs – if you are sitting at a pc all day, your eyes get a bit....	4
TOTAL			4

Movement: correspondence between grammar and interviewee data (MEC)

PROPERTIES (continued)

Aliveness	Grammar assessment	Interviewees' assessment	Correspondence Score 0-5
Speech	Desks ordered into double rows of 6 plus 6 suggest chat possible in immediate environs	Towards lunchtimes when you can almost hear the noise level going up – humming. Because people start to chat more. And all of a sudden you sense more noise. As a core team we had [them all around]. Quite good to sit that close together because we were able to hear and talk. I could talk to Mhairi across the way and speak to Mike quite quickly	5
Thinking	Imagine core space too noisy for quiet thought During day – use spare ancillary offices?	Put [headphones] in and crack on. Sometimes I can shut off without the headphones on	5
Life	The space feels quite positive and although commercial can see people work here	I can also people watch at lunchtime The mood-enhancers are [points it out] on the columns – it is meant to generate more daylight – gets you in a better mood	4
The I (personalise team space)	Team in bottom LH corner have their 2 large boards – apart from this hard to tell teams [apart]	[Work board] attracts people. It used to be on that wall – but it didn't tell the story that needs to be told. So I came up with the idea for this and ran it past the team – what do you think of the idea of a work board	5
The I (personalise individual space)	Some [individual workstations] more than others and generally tidy. A lot have name boards up	When you left [your desk] everything was to be put away. To me everybody's work space is their workspace, it is like their home, part of their personality. You really don't want somebody to put 20 plants on their desk and have only a tiny work area. At the same time everybody is an individual and they should be able to personalise their space.	5
TOTAL			24

Aliveness: correspondence between grammar and interviewee data (MEC)

PROPERTIES (continued)

Properties	Overall score	Highest possible correspondence	Accuracy %	Accuracy level
Comfort	4	20	20%	Low
Sight	29	30	96%	High
Sound	3	5	60%	Medium
Spaciousness	8	10	80%	High
Movement	4	5	80%	High
Aliveness	24	25	96%	High
TOTALS	**72**	**95**	**76%**	**MEDIUM**

Properties: overall correspondence between grammar and interviewee data (MEC)

BEHAVIOURS

Behaviour	Grammar assessment	Interviewees' assessment	Correspondence Score 0-5
Engage deliberately			
Engage deliberately with people formally	In the meeting rooms/empty offices off the space. More difficult in the space.	Meeting rooms all over [the building] but they are getting smaller and smaller. Meeting rooms are now getting chopped up for seating area. They have taken me out of the room I had and we are too large to go into the other room. It's a challenge If it's an internal meeting I would use my own room, I'd invite the guys to come in here. Sometimes encourage them to set meeting up in here	5
Engage deliberately with people informally	Canteen also – has screened areas In the meeting rooms	If you want a 5 min casual chat [...] usually use the Hub [canteen] to do that. Make a coffee and sit there – quite quiet. You see a lot of people doing that – a couple of people sitting around. So it does get used. I have 3 or 4 teams that are spread out in the open plan areas just outside my office I like being out and pulling up a chair at their desk. We stand [to have informal meetings]	5
Engage with information formally	Area in corner have team display board. Posters up re company all around core space and in area next to water. Photo-board of people. They have gone to an effort	[Work board] attracts people. It used to be on that wall – but it didn't tell the story that needs to be told. So I came up with the idea for this and ran it past the team – what do you think of the idea of a work board? [Meet] in blocks of teams, which they're working with on a daily basis, then more information is passed and it has made an improvement Any suggestion is never discarded – listen to everyone's suggestion	4
Engage with information informally	Informal: Area in corner have team display board. In core space makes this more difficult – no walls of their own Wall display next to water and offer of a book (only)	We sat and had a wee meeting to discuss how we need to move this particular issue. Sporadically meetings about updating the board	4
Engage by chance			
Experiment, play, try things out, craft, review	BE area although this seems a bit formal? People with their own offices have spare table to sit at and do stuff	We will all get together and put post-its on the wall, and have a brainstorming session There is a space here [in manager's office] with the table BE room	5
Engage by chance with people	Canteen, corridors, water space – but these are incidental. No real provision of	– I see one person and maybe they remind me to go and see another person [When we get the new table] people will come and speak to me, or I or M, and maybe they will	4

	chill out spaces Water/canteen/loos and recycling and photocopier mean that people should be walking about a fair bit	sit round and have a chitchat, which is good to have.	
Engage with ideas & information unexpect-edly and from outside the site	The building has facilities for seminars (e.g. two meeting rooms) + in canteen. People possibly tour factory, but not sure about here?	Customers come through office to go to Mackintosh room Regular visitors from outside	5
Disengage by movement			
Disengage by physical movement (short walks)	Yes, opportunities for this [Water/canteen/loos and recycling and photocopier mean that people should be walking about a fair bit]	Stretch legs – if you are sitting at a pc all day	5
Disengage by physical movement (longer periods of time) x2	Gym/showers, could probably jog near here but not very pretty	Gym	5
Mechanical movement	No mention	No mention	5
Disengage cognitively from others			
Daydream & reflection (work on own)	Possibly unused offices or canteen in a corner, but imagine it is fairly difficult	No mention	0
Think, write, generate ideas (no interruption)	Could be difficult to get privacy. Worse if near photocopier	I need to concentrate [...] and not get sucked into other things that's going on If people come and have a conversation, that's fine, I can blank it out or put my headphones on. But one of the other guys finds noise a distraction.	4
TOTAL			51

Behaviours: engage/disengage: correspondence between grammar and interviewee data (MEC)

BEHAVIOURS (continued)

Behaviours	Overall score	Highest possible correspondence	Accuracy %	Accuracy level
Engage deliberately				
• Formally with others	5	5	100%	High
• Informally with people	5	5	100%	High
• Formally with information	4	5	80%	High
• Informally with information	4	5	80%	High
Engage by chance				
• Experiment, play, try things out, craft, review	5	5	100%	High
• With people	4	5	80%	High
• With ideas & information unexpectedly and from outside the site	5	5	100%	High
Disengage				
• By physical movement (short walks)	5	5	100%	High
• By physical movement (longer periods of time) x2	5	5	100%	High
• Mechanical movement	5	5	100%	High
• Daydream & reflection (+ work on own)	0	5	0%	Low
• Think, write, generate ideas (+ no interruptions)	4	5	80%	High
TOTALS	**51**	**60**	**85%**	**HIGH**

Behaviours: overall correspondence between grammar and interviewee data (MEC)

AFFORDANCES

Affordance	Grammar assessment	Interviewees' assessment	Correspondence Score 0-5
Making thinking visible			
• Inside teams	They have this going on in one corner. Rest of space makes it difficult as no walls and no areas dedicated to this	Going past [the team board] attracts people. It used to be on that wall – but it didn't tell the story that needs to be told. So I came up with the idea for this and ran it past the team – what do you think of the idea of a work board.	4
• Between teams	They have this going on in one corner. Rest of space makes it difficult as no walls and no areas dedicated to this. Email? As above, one corner has it! I think this is a local benefit	[There is a] whiteboard with a pen; and some of the scribbles that are up there mean a lot to me, but maybe not a lot to someone who's just passing by	4
• Thinking visually together	Good provision of small/medium and large meeting rooms + canteen with projector	Get ideas up on the [white]board. I like the way people can write ideas up. No one wants to be the first one to write up, but it is good Whiteboard [...] and an overhead projector and pull down screen so we can project on the wall They can use the projector, or the whiteboard we have here.	5
Working together			
• Collaborating	Not sure. Email?	We were moved to be seated where the projects are, so we were collaborative. And because we are supporting projects you have people at each side In the Hub [canteen] they now have an outdoor patio and that gets used. More sun	2
• Informal conversations	Coffee machine, kitchen in canteen, water machine. Would be better with chill out area	You go in there [manager's office] for half an hour, have a quick blether [Scots for casual conversation], get your actions then come out	3
• Productive thinking	It seems as if there is a lot of productive thinking going on; books, poster; the company seems quite driven	New whiteboard on a roll. It is almost like tinfoil – sheets of A1 and it clings to the walls. [..] our guys go into any room with a roll of that tucked under their arm.	5

Serendipity

• Bumping into unexpected ideas and information	As above [walk to loos, water, photocopier] ancillary spaces have affordances but this [central] space you would walk through, visiting OK, although possibly bump into the same people as the routes are quite well defined	There are occasions when you are sitting in other conversations when [an idea] happens. Maybe sitting in some of the management meetings	4
• Bumping into people unexpectedly		If I see someone it triggers that I need to go and speak to that person, or a person from that department	5
• Experiment, playing, trying things out, crafting, reviewing	Good if they get to use the BE room, if not, not very good in their space i.e. no room and too ordered into banks of desks	The creativity comes [...] in team meetings, when they actually cluster together	4
• Generating ideas in a group	Good provision of small/medium and large meeting rooms + canteen with projector	It is difficult to have a cluster conversation and get creative. You could be interrupting other people One of these offices [points] is the portfolio manager for our project. [...]he has a big board, and we have daily meetings in his office to discuss that particular thing Have to book the rooms now	3

Disengagement by movement

• Casual movement	Yes, good although difficult to move into some people's spaces (eg the corner) unless you had an excuse	Stretch legs – if you are sitting at a pc all day, your eyes get a bit.... so I like to get up. We've got a work board down here, and it needs updated. And we have an A3 board here and that needs updated as well. So I can take time to see what's going on over here. I take a look and see what action needs to be done.	5
• Intense physical activity	Gym	Used to do the gym. I try to get up early in the morning and nip up for a swim two or three times a week. It can work for me [to think during the exercise].	5
• Mechanical movement	No mention	No mention	5

Disengage from others

• Daydreaming and reflection	Pretty poor – it seems like a work space. Canteen is not very conducive to this (hard space, not soft)	No mention	0
• Thinking and writing solo	Yes, if can use unoccupied offices + BE space? Canteen might be difficult sort of noisy and hard	Sometimes I'll listen to music. If I'm doing something repetitive, or something need to focus on, I'll put my headphones in and listen to music Your focus and concentration is on your computer or on your screen	3
• Generating ideas solo	Yes, if can use unoccupied offices + BE space? Canteen might be difficult sort of noisy and hard	There are times when there is a real deep problem that you need that quiet and lack of distraction. [...] when I am trying to develop something completely new from an existing problem and I'm sat there with a blank piece of paper. That can be quite hard, and there are times when I have closed the door and that.	4
TOTAL			63

Affordances: correspondence between grammar and interviewee data (MEC)

AFFORDANCES (continued)

Affordances	Overall score	Highest possible correspondence	Accuracy %	Accuracy level
Making thinking visible				
• Inside teams	4	5	80%	High
• Between teams	4	5	80%	High
• Thinking visually together	5	5	100%	High
Working together				
• Collaborating	2	5	40%	Low
• Informal conversations	3	5	60%	Medium
• Productive thinking	5	5	100%	High
Serendipity				
• Bumping into unexpected information and ideas	4	5	80%	High
• Bumping into people unexpectedly	5	5	100%	High
• Experimenting, playing, trying things out, crafting, reviewing	4	5	80%	High
• Generating ideas in a group	3	5	60%	Medium
Disengage by movement				
• Casual physical movement inside the building	5	5	100%	High
• Intense physical activity	5	5	100%	High
• Mechanical movement	5	5	100%	High
Disengage from others				
• Daydreaming and reflection	0	5	0%	Low
• Thinking and writing solo	3	5	60%	Medium
• Making ideas visible	4	5	80%	High
TOTALS	**61**	**80**	**77%**	**MEDIUM (HIGH)**

Affordances: overall correspondence between grammar and interviewee data (MEC)

OVERALL SCORING FOR CORRESPONDENCE BETWEEN GRAMMAR AND
INTERVIEWEE DATA IN FT1 (Multinational Engineering Company)

Grammar element (HI)	Overall correspondence score	Highest possible correspondence	Accuracy %	Accuracy level
Properties	72	95	76%	MEDIUM
Behaviours	51	60	85%	HIGH
Affordances	61	80	77%	MEDIUM
TOTAL	**184**	**235**	**78%**	**MEDIUM (High)**

MEC (FT1) workplace: Overall correspondence between grammar and interviewee data

Appendix 23: Final Test 2 (Financial Services organisation) correspondence between grammar and interview data

PROPERTIES

Comfort	Grammar assessment	Interviewees' assessment	Correspondence Score 0-5
Taste/smell	Feels a little stuffy	Canteen food mentioned by 1 of 4; Coffee, tea and soft drinks and junk food – all mentioned one or another	2
Touch	[Desks and chairs] appeared to be comfortable	Comfortable chairs 3 out of 4 There is a good amount of personal space in terms of your own personal desk	5
Temperature	It feel a little too warm	Heating level mentioned by 1 of 4 (was too low, now just right)	2
Air quality	Atmosphere is a little stuffy but pleasant	Air con okay 1 of 4	4
TOTAL			13

Comfort: correspondence between grammar and interviewee data (FT2)

Sight	Grammar assessment	Interviewees' assessment	Correspondence Score 0-5
Views to the exterior environment	Wide far reaching views on some areas and not as wide on others, but generally good visibility	Views (looking at the outside world) liked by 3 of 4 for connection with the outside world (people and weather) and short breaks looking up/out at interesting surroundings Being able to have natural daylight, to be able to be aware of the context of where you are, is important in being able to think	5
Natural light	Natural light floods the space	Natural light liked by all 4 I think it enhances your mood	5
Glare	No mention	No mention	5
Artificial light	No mention	Lighting mentioned by 2 of 4 as either adequate or good (no shadows cast)	0
Colour spectrum (2)	Colour scheme pleasantly cheerful. Colour scheme just right	Colours liked by 3 of 4 – and the feeling that there has been thought taken about the office	5
Orderliness/ Mess	The environment was very orderly	Orderliness liked by 2 of 4 – feeling of people caring about the environment	5
TOTAL			25

Sight: correspondence between grammar and interviewee data (FT2)

PROPERTIES (continued)

Sound	Grammar assessment	Interviewees' assessment	Correspondence Score 0-5
Sound spectrum (2)	Sound levels were normal, you could hear people talking here and there but nothing uncomfortable Quiet buzz	Quiet buzz background noise screened out by all 4 when necessary (one uses headphones to do it) Office buzz actively enjoyed by two of the four (would miss it) Where people have meetings at desks, and it is difficult to focus and maintain your strand of thought when you have got a lot of noise around you. Very little non-work chat (it happens in kitchens or canteen) In this office we don't have many of those [who 'tittle-tattle']	4
TOTAL			4

Sound: correspondence between grammar and interviewee data (FT2)

Spaciousness	Grammar assessment	Interviewees' assessment	Correspondence Score 0-5
Line-of-sight	line of sight is very long	Spaciousness actively noticed and appreciated by one of the interviewees, and by another vis à vis the feeling of line-of-sight by the windows You do have a nice open view so again you don't feel closed in	5
Ceiling height	Above 10ft	Ceiling height appreciated by one interviewee: I like the fact that it is a high ceiling so you don't feel enclosed, the fact that you do have a nice open view so again you don't feel closed in	5
TOTAL			

Spaciousness: correspondence between grammar and interviewee data (FT2)

Movement	Grammar assessment	Interviewees' assessment	Correspondence Score 0-5
Movement	People can walk about as much as they like	All interviewees use walking as a thinking break in or on the way to the office	5
TOTAL			

Movement: correspondence between grammar and interviewee data (FT2)

PROPERTIES (continued)

Aliveness	Grammar assessment	Interviewees' assessment	Correspondence Score 0-5
Speech	People can chat very easily	A lot of data on speech and thinking but all covered in the Behaviours section	5
Thinking	Quiet thought is very possible	All talk about iterative creativity – own work, group feedback and work, own work again	5
Life	Area did not feel too lively, even though it was open space. Perhaps lack of informal breakout zones within desk space area?	the connection with the wider world is important for all the interviewees Familiar sounds/buzz	3
The I (personalise team space)	Team spaces did not contain artefacts" but higher one for individual	Most of us are freelance, and I think freelancers don't tend to. We identify with the project and the team that we've be brought in to do, but we don't identify so much with the organisation	5
The I (personalise individual space)	Individual stations could be personalised and most were	some personal stuff: I've probably done a bit more than most	5
TOTAL			23

Aliveness: correspondence between grammar and interviewee data (FT2)

Properties	Overall score	Highest possible correspondence	Accuracy %	Accuracy level
Comfort	13	20	65%	Medium
Sight	25	30	83%	High
Sound	4	5	80%	High
Spaciousness	10	10	100%	High
Movement	5	5	100%	High
Aliveness	23	25	92%	High
TOTALS	**80**	**95**	**84%**	**HIGH**

Properties: overall correspondence between grammar and interviewee data (FT2)

BEHAVIOURS

Behaviour	Grammar assessment	Interviewees' assessment	Correspondence Score 0-5
Engage deliberately			
Engage deliberately with people formally	There are many meeting rooms within this office environment. Possibility for meetings is plentiful	All talk about iterative creativity – own work, group feedback and work, own work again, and the role that the focus rooms play in this	5
Engage deliberately with people informally	Several coffee/tea areas are arranged along the perimeter of this office environment. Chances for informal conversations are very possible	Discussion used by everyone – mainly in focus rooms So this kind of focus room is quite fashionable in office, and again, it's something that I value. If you want to discuss something with one of your colleagues – sometimes it's quite a robust discussion – it's easier on everyone else to go away from everyone else to do it. There is the canteen area, and some comfy chairs just outside in the reception area. So both the immediate reception for this but also there are some chairs out in the wider form	5
Engage with information formally	There were two TV units installed within corporate department stations at the very right hand side of the office space, many walls do allow for posters and screens, but I did not see any.	Processes involving drawing/diagrams used by all at different stages.	3
Engage with information informally	Every meeting room had a whiteboard. Personal desk space allowed for posted notes	White boards [...] are good! They get used – people get up and start drawing on it.	5
Engage by chance			
Experiment, play, try things out, craft, review	I did not observe any play spaces. Off meeting areas could be used as a workshop space	One talks of making it possible for others to be creative and to make connections between the team and the clients	4
Engage by chance with people	Several coffee places, canteen etc. created many opportunities for people to encounter each other by chance	Chance conversations in the kitchen area (2 interviewees)	5

BEHAVIOURS (continued)

Engage with ideas & information unexpectedly and from outside	Large corridor/chill out area outside this office space could be described as a space where unexpected encounters can happen	Use the focus rooms for discussion and group idea-generating + diagrams etc	4
Disengage by movement			
Disengage by physical movement (short walks)	Space allowed for many possible short walks	Walking: all interviewees. Some inside the building, some in the mall, some outside All conscious of using walking to have longer or shorter breaks, and to incubate their thinking ("and I come back to my desk and I might then feel better about the work and have moved on.")	5
Disengage by physical movement (longer periods of time) x2	I don't know about this point Not sure about this point	No mention	5
Mechanical movement	Distance to bus, train and car park was easy.	Mechanical movement mentioned only once, and not used as thinking mechanism	3
Disengage from people			
Daydream & reflection (work on own)	Large and small meeting areas were available for reflections Large and small meeting areas were available for working on one's own	One person is in the [focus] room working on a laptop" 3 of the 4 disconnect by looking outside: Connection with the outside world very important to all of them, though not necessary to No.4	5
Think, write, generate ideas (no interruption)	Large and small meeting areas were available for working without interruption	All good at concentrating in the office for long periods of time.	5
TOTAL			54

Behaviours: engage/disengage: correspondence between grammar and interviewee data (FT2)

BEHAVIOURS (continued)

Behaviours	Overall score	Highest possible correspondence	Accuracy %	Accuracy level
Engage deliberately				
• Formally with others	5	5	100%	High
• Informally with people	5	5	100%	High
• Formally with information	3	5	60%	Medium
• Informally with information	5	5	100%	High
Engage by chance				
• Experiment, play, try things out, craft, review	4	5	80%	High
• With people	5	5	100%	High
• With ideas & information unexpectedly and from outside the site	4	5	80%	High
Disengage				
• By physical movement (short walks)	5	5	100%	High
• By physical movement (longer periods of time) x2	5	5	100%	High
• Mechanical movement	3	5	60%	Medium
• Daydream & reflection (+ work on own)	5	5	100%	High
• Think, write, generate ideas (+ no interruptions)	5	5	100%	High
TOTALS	**54**	**60**	**90%**	**HIGH**

Behaviours: overall correspondence between grammar and interviewee data (FT2)

AFFORDANCES

Affordance	Grammar assessment	Interviewees' assessment	Correspondence Score 0-5
Making thinking visible			
• Inside teams	Very possible. Many available meeting rooms and the desk layout also allowed for group work Whiteboards, flipcharts, writing walls, post-it boards	The main affordances are the focus rooms and their equipment, especially the whiteboards for making thinking visible/sharing ideas and information	5
• Between teams	All the above were available	The main affordances are the focus rooms and their equipment, especially the whiteboards for making thinking visible/sharing ideas and information	5
• Thinking visually together	All the above were available in meeting rooms , which were plentiful	Focus rooms	5
Working together			
• Collaborating	Office was equipped with Internet and had meeting rooms which can make it quite easy to collaborate with others	Technology tools for work – laptop, email, phone, conference call equipment If I need a meeting and the focus rooms are all booked up I will go and have a coffee with them downstairs, in the Costa coffee and sit down I have close contact with colleagues who are working on the project either directly or indirectly, so from that point of view if I am mulling over things there are always people around me that I can bounce ideas off	5
• Informal conversations	Space -allowed for the above. Plenty -areas	The kitchen/printer facilities – vending machine, hot water/ice water tap, sink – for chance encounters and informal/social chat	4
• Productive thinking	Very possible, but not at all times. Meeting rooms could be closed behind doors making this affordance a bit more difficult	You can book a focus room for 2 hours, and I'll put a sign on the door like that [the sign booking it out for the interviews] it's now mine, and it's booked away. People generally respect that.	4

AFFORDANCES (continued)

Serendipity

• Bumping into unexpected ideas and information	This seemed to be a little more difficult as all the spaces could be closed and they were closed door while the meetings and presentations happened	No team boards/spaces or signage for engaging with/sharing ideas or information. The only thing is they have some suspended [signs saying UK. International etc] – that is quite broad brush. You do get people wandering around saying I'm looking for this team or that team	5
• Bumping into people unexpectedly	It was very possible to bump into people unexpectedly due to large number of coffee/printing areas	Canteen for breaks, and for informal meetings/coffee, printer/coffee rooms If I'm making a cup of tea I quite often get chatting to people just as a result of that – you ask what they do. And a couple of times I've actually ended up talking to someone that, at a point later on, I happen to engage with from a project perspective. So that's been beneficial because I already know them, albeit from a two-minute kitchen conversation	5
• Experiment, playing, trying things out, crafting, reviewing	All meeting rooms had whiteboards. All work desks could have posted notes.	[What do I] do to get the creative juices flowing? Em, I like to scribble, I like to draw pictures. I take a big piece of A3 and I'll draw a process and scratch it out and start again	4
• Generating ideas in a group	Yes, many large and small meeting rooms, but did not see any sofas.	Focus rooms mentioned by all	5

Disengagement by movement

• Casual movement	Movement was easy and straightforward with long vistas and many areas to go to	It does sometimes help to get up and walk about. [...] because I like the idea of the colours, I walk the length of the colours. It might sound daft, I use a loo right at the far end sometimes because I know it will walk me through it	5
• Intense physical activity	Not sure	No mention	5
• Mechanical movement	Office was accessible via lift, stairs and escalators, so movement was easy	No mention	0

AFFORDANCES (continued)

Disengage from others			
• Daydreaming and reflection	I could not see any sofas, but secluded meeting areas were there.	Focus rooms [I put] earphones in. Never at a level that I can't hear the rest of the office. It's when I focus on what I'm doing, it is more in the background. So I am not hearing the conversation, but I'm aware that there's a conversation happening. I'm not hearing the details of it. And if people come up to talk to me, I can talk with them in, but I flip them out as a courtesy	5
• Thinking and writing solo	Yes, lots of small meeting rooms which could be used for thinking and writing solo	You can book a focus room for 2 hours, and I'll put a sign on the door like that [the sign booking it out for the interviews] it's now mine, and it's booked away. People generally respect that.	5
• Generating ideas solo	Yes, many large and small meeting rooms, but did not see any sofas.	Focus rooms for diagramming and drawing	5
TOTAL			72

Affordances: correspondence between grammar and interview data (FT2)

AFFORDANCES (continued)

Affordances	Overall score	Highest possible correspondence	Accuracy %	Accuracy level
Making thinking visible				
• Inside teams	5	5	100%	High
• Between teams	5	5	100%	High
• Thinking visually together	5	5	100%	High
Working together				
• Collaborating	5	5	100%	High
• Informal conversations	4	5	80%	High
• Productive thinking	4	5	80%	High
Serendipity				
• Bumping into unexpected information and ideas	5	5	100%	High
• Bumping into people unexpectedly	5	5	100%	High
• Experimenting, playing, trying things out, crafting, reviewing	4	5	80%	High
• Generating ideas in a group	5	5	100%	High
Disengage by movement				
• Casual physical movement inside the building	5	5	100%	High
• Intense physical activity	5	5	100%	High
• Mechanical movement	0	5	0%	Low
Disengage from others				
• Daydreaming and reflection	5	5	100%	High
• Thinking and writing solo	5	5	100%	High
• Making ideas visible	5	5	100%	High
TOTALS	**72**	**80**	**90%**	**HIGH**

Affordances: overall correspondence between grammar and interviewee data (FT2)

OVERALL SCORING FOR CORRESPONDENCE BETWEEN GRAMMAR AND
INTERVIEWEE DATA IN FT2 (Financial Services organisation)

Grammar element (HI)	Overall correspondence score	Highest possible correspondence	Accuracy %	Accuracy level
Properties	80	95	84%	High
Behaviours	54	60	90%	High
Affordances	72	80	92%	High
TOTAL	**206**	**235**	**87%**	**HIGH**

FT2 workplace: correspondence between grammar and interviewee data

Appendix 24: Publications

Williams, A. (2009). Creativity Footprint: the impact of physical space on workplace creativity. *Conference Proceedings Creativity & Cognition 09.*

Williams, A. (2011). Creativity Syntax: Codifying Physical Space's Impact on Creativity in the Workplace. *Conference Proceedings Creativity & Cognition 11.*

Aragon, C. A. & Williams, A. (2011). Collaborative Creativity: A Complex Systems Model with Distributed Affect. *Conference Proceedings CHI 11.*