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# Characteristics & Behaviours of Innovative People in Organisations

## Literature review

### A paper prepared for NESTA Policy and Research Unit (NPRU)

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# Introduction

## Overview & aims

The research literature on the characteristics and behaviours associated with innovative people in organisations is immense, both in magnitude and diversity. As a result there has been a lack of a cohesive theoretical understanding of how individual creativity and innovation operate in organisations. A key aim of this research is to develop an integrative framework to understand the characteristics and behaviours of innovative people in organisations. The specific aims of the research are to:

- Deliver a systematic and extensive literature review relevant to innovative people in organisations drawing upon entrepreneurship, innovation, the wider business and psychological literatures.
- Synthesise research, concepts and understanding in the area of individual innovators across all sectors.
- Develop a new integrative and unified framework to understand the characteristics and behaviours of innovative people in organisations.
- Provide an initial test of the framework using stakeholder interviews and organisational surveys.
- Review interventions at the individual, group and organisational level of analysis designed to enhance innovative working in organisations in consultation with stakeholders.

The outputs of this research will inform the development and delivery of policy implications for NESTA, including an exploration of linkages with other research and policy initiatives (e.g. government training, education, and lifelong learning policy implications).

This document is the first publication of the research reporting the literature review. An Executive Summary of this review is also available. A survey and interviews with senior stakeholders from the public, private, and voluntary sectors will form the next stage of the research. The full report will be published in June 2009.

## Background & context

An article in *The Economist* (Frymire, 2006) argues that "*the biggest challenge today is not finding or hiring cheap workers, but rather hiring individuals with the brainpower (both natural and trained) and especially the ability to think creatively*"; p.11. Even in the current economic climate, there is evidence of the increasing importance of innovation *"During economic downturns innovation is the single most important condition for transforming the crisis into an opportunity"* (http://www.nesta.org.uk/economic-downturn). The DIUS white paper 'Innovation Nation' (2008) provides an ambitious new direction for UK innovation policy. However, current evidence indicates that organisations need to understand how to identify the characteristics and behaviours of innovative people and consequently, how to promote and encourage innovative working within organisations.

Innovation is critical for organisational long-term prosperity, particularly in dynamic markets (Balkin et al, 2000; Lyon & Ferrier, 2002; Utterback, 1994; Wolfe, 1994). In view of today's economic climate, increasing global competition, and rapidly changing organisations, an organisation's ability to innovate is regarded as a key factor for success (Shipton, 2006) and often for mere ongoing survival (Oldham & Cummings, 1996). Whilst the notion that firms need to innovate dates back to the early 1930s (Schumpeter, 1934), governments and organisations are now acutely aware that firms face the challenge of developing new products, systems and processes on a systematic basis. Current BERR policy suggests that innovation is "*a major determinant of productivity performance*" and that differences in innovation performance are "*a significant cause of the UK's relatively weaker productivity performance*" (p.9). This view is backed by extensive research evidence demonstrating a strong positive impact of innovation on firm performance (Brown & Eisenhard 1995; Damanpour & Evan 1984; Damanpour et al. 1989; Hansen, Nohria & Tierney 1999; Roberts 1999; Schulz & Jobe 2001). The UK's ability to innovate is especially relevant for service and products firms which have to differentiate themselves from competitors, which offer low cost products from India, China and elsewhere.

The realisation that innovation in organisations is a necessity has led to an explosion of activity ranging from academic papers on theoretical models and the fundamentals of innovation, to government white papers, to

organisational policy documents and to countless consulting firms offering to enhance innovation in the workplace. Organisations recognise that creating new processes, products and procedures is vital for productivity and growth in all sectors. With more dispersed and virtual working, role innovation is essential, since clearly defined job descriptions for employees no longer exist for many job roles. There is now a general recognition that the innovative potential of an organisation resides in the knowledge, skills, and abilities of its employees. This view emerged in the late 1980s/early 1990s, where "*people, not products, are an innovative company's major assets*" (Gupta & Singhal, 1993; Van de Ven, 1986; Vrakking, 1990). There is growing recognition that the organisational context and support from leaders and managers play a crucial role in enhancing employees' motivation and in the development and implementation of innovation. Importantly, several recent innovation surveys carried out in the UK and in Europe have identified finding and mobilising *human resources* as one of the most important barriers to innovation (European Innobarometer Survey, 2001). Specifically, organisations indicated that problems with skill levels (managerial skills particularly) and motivation hampered innovation (Tether et al, 2005). Whilst governments are responding to the emphasis on greater innovation and the need to tackle skill shortages with a focus on education, the link between what we know on the skills of individual innovators and how they relate to the management practice and the wider organisational context is still not clear. Recent research indicates that innovation programmes rarely achieve desired results. Meanwhile, practitioners and management academics continue to ask for greater innovation output by employees.

The research literature on the characteristics and behaviours associated with innovative people in organisations is immense, both in magnitude and diversity. In recent years, several handbooks devoted to creativity and innovation have been published (eg. Zhou & Shalley, 2008), there are many journals devoted exclusively to this issue, and the number of books and technical reports on this topic continues to grow (e.g., Nooteboom & Stam, 2008; Sawyer, 2006; Sternberg, Grigorenko, & Singer, 2004). However, several scholars have observed the lack of a cohesive theoretical understanding of how creativity and innovation operate in organisations (Patterson, 2002).

One key problem, which has been the subject of much debate recently, is that the literature on innovation and related concepts such as creativity and entrepreneurship, is vast, heterogeneous and fragmented (Denyer & Neely, 2004). Researchers tend to agree that an individual's ability to innovate at work is influenced by several factors, which can be classified into three levels of analysis: the *individual*, *group*, and *organisational* level. However, findings generally lack integration. Different fields, such as management, business, economics and organisational psychology tend to explore the concept of innovation from different vantage points and often ignore findings arising from other disciplines. The economics approach for example has been mainly concerned with issues such as government interventions and technology infrastructure. The scientific community has tended to focus on a narrower instrumentalist perspective of innovation (Woolpert, 2002). There are also diversities in approach amongst sub-disciplines. Organisational psychologists have studied creativity focusing primarily on the individual and the group; the management and business communities have focused primarily on organisational innovation, without much attention paid to the skills of individual innovators. A key problem with the literature (which partly explains the lack of integration of findings), stems from the difficulty in defining and understanding the phenomenon of innovation and how it can inform practice. Historically there has been confusion in terminology regarding innovation and creativity, particularly in definitions and in criteria for assessment. However, more recently, greater consensus has been achieved.

## Defining innovation

It is important to clearly define innovation and to distinguish it from related concepts such as creativity, entrepreneurship, adaptability, originality, productivity, and novelty. In the past, some research papers have lacked a clear differentiation between the creativity and the innovation constructs, leading to a misunderstanding regarding the antecedents and outcomes of creativity and organisational innovation.
Patterson (2005) argues that creativity and innovation are overlapping constructs, but the main distinction is with regard to novelty. Creativity is exclusively concerned with generating new and entirely original ideas. Innovation is a broader concept as it also encompasses the application of new ideas to produce something new and useful (in the context of groups, organisations or societies). Innovation is often referred to as a process, because implementing new ideas necessarily involves influencing others (whereas creativity could be achieved in isolation). Employee innovation goes beyond individual creativity as it also concerns the extent to which

employees implement and sustain innovations. Further, an innovation could be the application of something familiar in one organisation to another unfamiliar organisation (ie. imported innovation).

In the organisational psychology literature, West and Farr (1990) emphasised the positive nature of innovation; *'… the intentional introduction and application within a role, group or organisation of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, the organisation or wider society'* (p. 9). In 2003, the UK Department of Trade and Industry adopted a more concise definition of innovation as; "*the successful exploitation of new ideas*". Consistent with conceptualisations used in both the management and psychology literatures, for this study we adopt NESTA's definition of innovation as "***change associated with the creation and adaptation of ideas that are new-to-world, new to nation/region, new-to-industry or new-to-firm***". This definition encompasses both the *processes* individuals use and the *outcomes* that they develop. It includes a wide range of innovation types (product, process, technological, administrative, incremental, etc) that occur in organisations.

*Key Message*
*The characteristics and behaviours of people in organisations are at the core of organisational innovation. Whilst the biggest challenge for many organisations at present may be surviving the current economic climate, promoting and encouraging innovative working is argued to contribute to long term organisational survival.*

## Methodology

Our review focuses on identifying the characteristics and behaviours of innovative people in organisations. We adopt an interdisciplinary perspective, drawing upon and synthesising insights from research in organisational psychology, business, management, and human resource management (HRM). Whilst employees clearly need a supportive organisational context in order to innovate, employees' knowledge, skills, and abilities are key resources for innovation in organisations.

The purpose of this literature review is to explore the individual variables (skills/abilities) that influence organisational innovation and the individual behaviours and roles that lead to innovation. In addition, our review focuses on the identification of effective organisational interventions which are likely to enhance employee innovation. Whilst the review centres primarily on the characteristics of innovators in organisations, these are viewed within the wider organisational context, in order to acknowledge that modern innovations usually require a collective achievement at the work-group and organisational levels. It is important to bear in mind that most of the research on innovation in organisations often fails to portray the diversity of organisations in that it is generally based on large organisations, at the exclusion of smaller firms in the public or voluntary sectors. Issues that are important for larger companies may bear little relevance for smaller firms and this important topic will be examined in the second part of the project.

Our aim is to narrow the gap between *theoretical* approaches to innovation and creativity and organisational innovation in *practice*. Whilst many organisations are committed to promoting innovation, they often lack a clear understanding of how to translate theories on innovative characteristics and behaviours of employees into practical solutions. Several researchers have lamented the wide gap between research and management practice in this area (Aram & Saliparte, 2000; Berry, 1995; Denyer & Neely, 2004; Hodgkinson et al, 2001; Pettigrew, 1997; Pffeffer & Sutton, 1999; Starkey & Madan, 2001; Tranfield & Starkey, 1998; Van de Ven & Johnson, 2003; Wind & Nueno, 1998). Organisations often fail to manage innovation and innovative people well and few organisations possess the capability to sustain innovation over the long-term (Adams et al, 2006; Cormican & O'Sullivan, 2004).

The view that innovation is an organisational process burdened by insurmountable difficulties is still prevalent (Chandy, Hopstaken, Narasimhan, & Prabhu, 2006). This tendency needs to be challenged if organisations are to fulfil their aim of growth through innovation.

Whilst much is known about the individual, team, and organisational characteristics that enhance innovation in the workplace, there lacks a comprehensive, user-friendly framework which helps firms to recruit, develop, manage, and retain innovative people.

Key challenges include:

- *What are valid approaches to select, support, train and develop innovative people in organisations?*
- *How do we best engage employees in the innovation process?*
- *In what ways do employee resources contribute to the various phases of the innovation process, namely generation and implementation?*
- *What can managers do to enhance innovation?*
- *Where is the evidence that interventions aimed at improving innovation actually work?*
- *What are the barriers and catalysts for innovative behaviours in organisations?*
- *What are the policy implications?*

The review is by no means exhaustive; we intend to highlight key research and policy contributions to understanding the characteristics and behaviours of innovative people in organisations. The following parameters were used to conduct our literature search:

- Highlight studies that have significantly influenced thinking and understanding in this field.
- Incorporate major reviews.
- Focus on papers that are widely cited, and papers published in journals ranked as "*World Leading*" (Aston Journal Ranking, 2006).
- Capture themes raised by leading protagonists and where appropriate, include papers that offer empirical insights.
- Search using key words related to creativity and innovation in electronic databases which reflect the business management and organisational psychology perspectives (eg. Business Source Complete, PsychInfo).

A key challenge in this area is that terminology is often confused (often, the terms 'creativity' and 'innovation' are used interchangeably). Whilst the main focus of this review is to explore people and innovation in organisations, we necessarily draw upon research using a variety of terms, with different degrees of emphasis, on the innovative or creative phases of the innovation process. Innovation is a complex phenomenon, and different 'people' resources may be required at different phases of the innovation process in organisations. Hence, in this review we attempt to define the aspects of the innovation process addressed in the articles referenced, and to indicate, where possible, whether different resources may be needed for various aspects of the innovation process.

## Structure of review

The first two sections of the literature review examine the role of the employee and work environment in enhancing innovation (section 1 & 2). Synthesising insights from the organisational psychology and management literatures, we present a framework that delineates the people relevant resources for innovation in organisations (Figure 1 below).

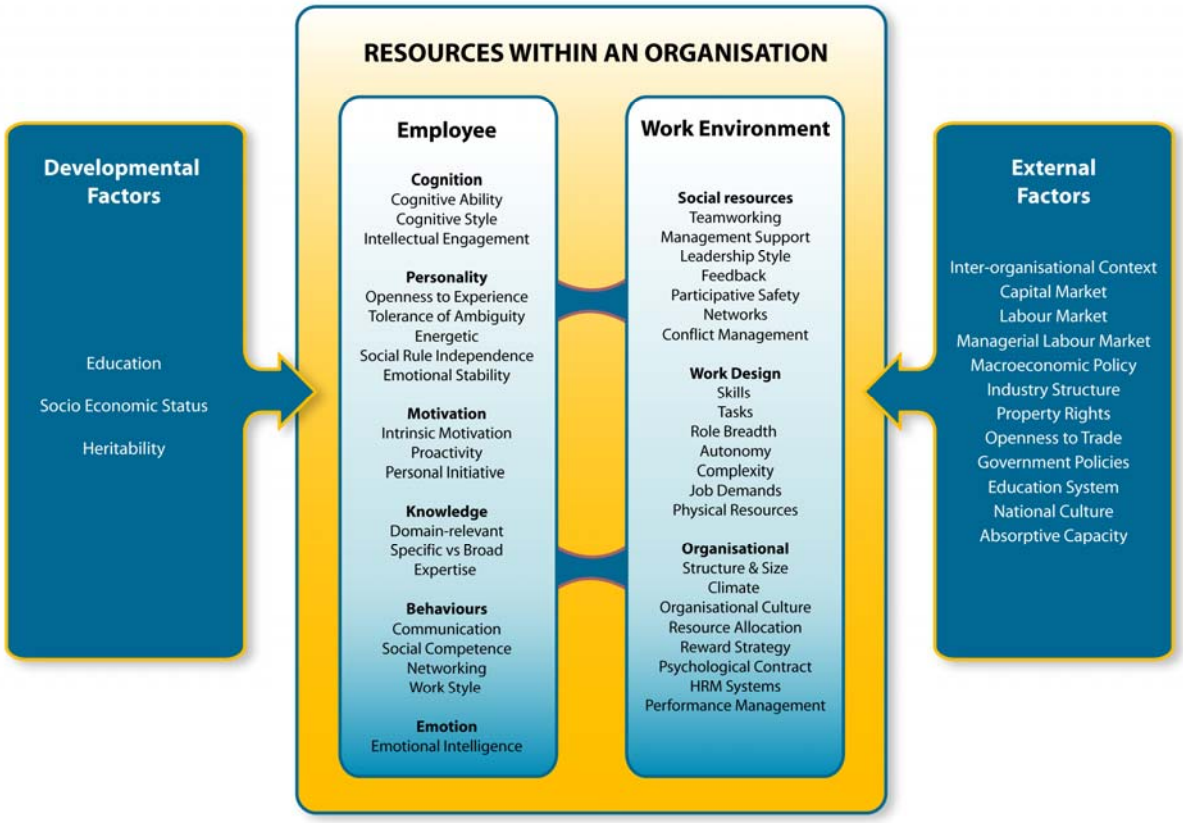
In section 3 the importance of understanding and defining innovation as a process is considered. It examines how the view of innovation as a complex, iterative process, with two main phases (generation and implementation) affects how we interpret and utilise available resources for innovation. A conceptual mapping of the people relevant resources to the innovation process in organisations is presented (Figure 2)

Uniquely, in section 4 of the report, our research on innovative working is mapped to the employee life cycle phases, that is, the attraction, development and retention of individuals in organisations. We review the various inhibitors and catalysts to innovation and how they link to the life cycle (Figure 3). We also consider how a multi-disciplinary understanding of employee innovation resources and of the innovation process can be applied to innovation interventions in organisations. After reviewing a variety of practical methods, tools, and techniques used to foster innovation, and available empirical evidence on the validity of these techniques, we propose a framework of innovation interventions (Figure 4) for the different phases of an employee life cycle. Finally, in section 5, future research directions and next steps for the current research are considered.

Our aim is to facilitate the translation of the research findings to potential organisational solutions to guide those responsible for operationalising innovative working in organisations. The outputs can inform corporate policy in the area of employee innovation.

*Key Message*
*The aim of this review is to develop an initial unifying framework to integrate and classify the characteristics and behaviours of innovative people in organisations (linking antecedents and outcomes). The review will uniquely map the outputs to the employee life cycle to facilitate translation of the research findings to the organisational context.*

**Figure 1. People relevant resources for innovation in organisations**




## External factors to employee innovation

There are a plethora of external resources which are known to influence employee innovation. Whilst presenting an exhaustive and detailed list of these resources is beyond the scope of this review, it is recognised that macro-level factors may affect levels of employee innovation in organisations. These include general government policies such as *education* and *fiscal policies*, the labour market including *managerial skills* and *labour market flexibility*, and the *macroeconomic policy*.

The ***education*** system is a powerful influencing factor for innovation. Policy here strives to provide individuals with the right skills throughout their formative years (Dahkli & de Clercq, 2004). Education in the

UK is believed to be good at the upper end of the ability range. However, economists have called for an increased focus on post school vocational education in order to respond to the shortfall in technical skills, which may decrease the absorption of innovations.

Some argue there is insufficient emphasis on general ***management skills*** in the UK ***labour market***. Since general management skills are not as highly regarded and remunerated as consultancy or accountancy skills in the UK, talented graduates tend to choose a different career pathway. Research shows that a variety of policy factors, including high competition and flexible labour markets are key to improved management practices in organisations. High levels of competition, expressed as narrow industry profit margins, trade openness, or number of competitors, are associated with improved management practices and enhanced innovation (Blundell et al, 1999). When levels of competition are high, good practices tend to spread quickly and poor practices often do not survive and are therefore eliminated. Flexible labour markets and the associated flexible employment laws enable organisations to adopt better and more efficient Human Resource management practices, which in turn allow for improvements in the selection, management, and retention of skilled employees.

Stable money markets are likely to increase the overall investment climates for organisations. The recent dramatic economic events and the unstable ***macro economy climate*** are likely to have repercussions on overall investment in firms. However, historically uncertainty generated by external demands and potential threats has been shown to stimulate innovation; this is partly linked to heightened competition and the survival of the fittest. Nevertheless, under extremely threatening conditions some organisations tend to centralise control, conserve resources, restrict information flow and rely on more traditional work methods. The fiscal policy adopted by governments (e.g tax breaks) will have a direct impact on investments for innovation (Hall & Van Reenen, 2000).

The ability of an organisation to acquire, assimilate, transform, and exploit external knowledge, is labelled as a firm's ***'absorptive capacity'***. Research shows this is often critical for the innovation process. An organisation's absorptive capacity is dependent on the ability to establish, manage and learn from inter-formal or informal organisational ties. Mahroum (2008) argues that in order to be innovative, organisations should become 'intrinsically global'. Universities, international academic networks and multinational firms are critical resources for an organisation's absorptive capacity. This implies that more attention should be paid to attracting and retaining talented domestic and international students after they graduate from university.

*Key message*
*There are a number of key external factors that will influence employee innovation including education, labour markets, macro economic climate and absorptive capacity. These are acknowledged as contributing factors but the scope of this review will focus on employee resources for innovation within the organisation.*

# 1. Employee resources for innovation

The extant literature suggests a number of individual, work environment and external resources that are likely to influence employee innovation within organisations. Figure 1 represents an attempt to summarise and highlight the core employee resources related to innovation outcomes. The resources highlighted in Figure 1 located ***within the organisation*** are analysed in more detail here.

The majority of innovation research conducted over the years has focused on identifying the various traits and personal characteristics that facilitate individual or group innovation. Research shows that innovation involves multiple components at the individual level. However, there has been little synthesis of the literature to build a framework within which to explore the many inter-related characteristics involved. Only recently, have research efforts shifted towards more integrative approaches. For example, in 1999, Sternberg and Lubart proposed an '*investment theory'*, suggesting that the propensity to innovate requires a confluence of six distinct resources including intellectual abilities, knowledge, styles of thinking, personality, motivation and environment. Other integrative approaches include the "*geneplore*" model and the "*componential model*". These models reflect the key areas of research at the person level where previous literature can be classified into associations between innovation and, (i) cognitive ability, (ii) personality, iii) motivation, (iv) knowledge, (v) behavioural abilities and (vi) emotion, mood states.

The relationship between innovation potential and key individual-level resources, such as cognitive ability, knowledge, personality, behaviour, motivation, and affect are reviewed.

## 1.1 Cognition

Numerous researchers have explored the association between innovation potential and intelligence. However, the findings are generally inconclusive. Much of the literature in this area can be classified into four categories, conceiving of innovation as; (a) a subset of *general intelligence* (b) an aspect of *genius*, (c) a set of *cognitive abilities* and mental processes, and (d) associated with *observer judgments* of intelligence. A brief review of these is provided below.

*(a) General intelligence.* Early research claimed that creativity was equivalent to high intelligence. The best-known researcher in this field is Guilford. In his theory of the Structure of Intellect (SI) published in the 1950s, he claimed that creative thinking was a mental ability, involving divergent production as '*thinking that goes off in different directions*'. Many researchers followed Guilford's work by producing evidence that ideational fluency (i.e. quantity of new ideas) underlies divergent thinking test scores. However, review studies have criticised the use of divergent thinking test as a measure of creativity (Barron & Harrington, 1981; Lubart, 2003).

Other investigations (Gilhooly et al, 2004) have tested the possibility of a curvilinear relationship between intelligence and innovation where intelligence would potentially become less influential as the level of intelligence increases beyond a certain point. However, tests have proved inconclusive and some authors doubt whether divergent thinking tests measure abilities actually involved in creative thinking at all (Runco, 2008).

*(b) Genius*. Some (e.g. Eysenck) have suggested that genius, as the most obvious manifestation of high intelligence, is closely tied to the propensity for innovation. However, there has been a substantial lack of evidence to support a direct relationship between innovation and intelligence. Many, including Eysenck himself, have concluded that intelligence is a necessary, but not a sufficient, condition for innovation. Recent studies conclude that intelligence and innovation potential are moderately related, but once IQ scores go over 115 the relationship is near zero. This finding has been described as 'threshold theory', were instead of being twin or even sibling constructs, intelligence and innovation potential may be more like 'cousins' (Feist & Barron, 2003).

*(c) Cognitive abilities*. In the 1992, Finke, Ward and Smith suggested that in order to understand the role of cognitive abilities in idea generation, we must draw upon current models in cognitive psychology, and use experimentally based observations of the processes that underlie generative tasks. Their work follows a

framework called the 'geneplore model'. The model proposes that many creative activities can be described in terms of an initial generation of ideas or solutions followed by an extensive exploration of those ideas. Initial ideas are referred to as 'pre-inventive', in the sense that they are incomplete solutions, but offer promise in terms of originality and utility. The model assumes that one would alternate between generative and exploratory phases, refining the structures according to the demands or constraints of the specific task. This 'creative cognition' approach emphasises that generative capacity is a property of normative human cognition. Individual differences occur due to variations in the use and application of these generative processes, together with the sophistication of an individual's memory and knowledge in the relevant domain. In simple terms, the capacity for creative cognition is normally distributed; highly creative people do not have minds that operate in any fundamentally different way to other individuals. Tuned generative thinking and contextual application are necessary but not sufficient conditions for innovation. Researchers have called for studies that investigate the specific cognitive abilities involved required for the implementation phase of the innovation process (Mumford, 2003).

*(d) Observer judgments of intelligence*. Innovative individuals are often perceived and rated by others as more intelligent than less innovative individuals. For example, in MacKinnon's studies of architects in the 1960's, supervisors rated innovative architects as more 'intelligent' than less innovative individuals. MacKinnon described the innovative architects to have high 'effective intelligence', and argued that traditional measures of intelligence (e.g. IQ) do not fully explain this 'real-world' intelligence. In 2003, Feist and Barron showed that observer-rated intelligence at age 27 predicted lifetime innovation at age 72. Similarly, tested intelligence had much weaker relationships with innovation over this time.

Historically, the literature on innovation and intelligence has lacked clarity. Part of the problem has been that intelligence (similar to innovation), is often viewed as a unitary concept. Previous theories of intelligence have tended to over-emphasize cognitive abilities and downplay the role of knowledge-based intelligence.

*Key message*
*Intelligence is a necessary but not sufficient condition for innovation. Cognitive ability alone does not account for much of the variance observed in individual innovative performance.*

## 1.2 Knowledge

Almost all researchers in this field, regardless of their theoretical approach, have assumed that knowledge is a key variable in both generative thinking and innovation. Immersion in domain specific knowledge is an essential pre-requisite for innovation, as one must have an accurate sense of domain (i.e. contextual relevance) before one can hope to change it for the better. However, the literature highlights that too much expertise in one area can also be a block to innovation within that domain (Sternberg, 1982). There is an inverted U relationship between knowledge and innovation, where too much or too little knowledge will not lead to new inventions. In the 1980s, Simonton studied the lives of over 300 eminent people to explore lifespan development of innovation and found that both a lack of, and an excess of, familiarity within a subject domain, can be detrimental to innovation.

The research literature highlights that an intense involvement in domain specific knowledge is a pre-requisite for innovation. Domain-relevant knowledge reflects how much an individual knows about a given area; the literature suggests that it does not need to be highly complex or detailed and it can be broad (Amabile, 1996; Mascitelli, 2000). Csikszentmihayli (1988) suggests that an individual who wants to make an innovative contribution must not only work within a system, but must also reproduce that system in his or her mind. Personal mastery and an accurate sense of domain (contextual) are necessary antecedents of innovation. However, domain knowledge, like intelligence, is necessary, but not sufficient for innovation to occur.

*Key message*
*Domain-specific knowledge is a key resource for innovation in organisations. Employees must understand their job role and requirements before innovation occurs*

## 1.3 Motivation

High levels of motivation are required for innovation and innovators are viewed as displaying a devotion and total absorption in their work (Eysenck, 1994). In the 1980s, Amabile suggested a componential model of innovation that involves three components including intrinsic task motivation, domain-relevant skills (i.e. expertise) and innovation relevant process skills (cognitive skills and work styles conducive to novelty). The model includes a five-stage description of the innovation process; task presentation, preparation, idea generation, idea validation, and outcome assessment, where the roles of the three components vary at each of the stages. Amabile's model suggests how and where individual skills and motivation affect the progress of the innovation process.

Although theories on innovation and creativity never fail to refer to intrinsic motivation as one of the most important antecedents of creativity and innovation, few studies have empirically studied the association between intrinsic motivation and innovation. One exception is a study by Shin and Zhou (2003), who reported that a transformational style of leadership promoted employees intrinsic motivation, which was conducive to creative performance. Similarly, in a laboratory based study, Sosik et al (1999) found that a transformational leadership style was conducive to '*flow*', a psychological state characterised by intrinsic motivation, concentration, and enjoyment, which encourages idea generation. These studies provide support for the notion that motivation may be an important mediator between leadership style and creative performance.

Whilst intrinsic motivation is clearly a pre-requisite for innovation (Amabile, 1988; Frese et al, 1999; West, 1987), the role of extrinsic motivators is less clear (Harrison et al, 2006). In exploring environmental influences on motivation, the evidence suggests that constructive evaluation (i.e. informative, supportive, recognizes accomplishment) can enhance innovation. Amabile suggests that intrinsic motivation is particularly important in tasks that require novelty and extrinsic motivators may be a distraction during the early stages of the innovation process. Later in the innovation process, where persistence and evaluation of ideas is required, synergistic extrinsic motivators may help innovators persist in the solving the problem within the domain. Any extrinsic motivator that enhances an employee's sense of competence without undermining self-determination, should enhance intrinsic motivation and thus, increase the propensity for innovation (Eisenberg & Cameron, 1996). It is also possible, as suggested by Mumford (2003), that intrinsic and extrinsic motivation might serve different functions; whilst intrinsic motivation might be linked to work on a task, extrinsic motivation might affect choice of task, field, or implementation strategy.

Sauermann and Cohen (2008) recently analysed the impact of individual motivation on organisational innovation and performance. They found that intrinsic and extrinsic motivation affected both individual effort and the overall quality of the innovative endeavours. The study confirmed that extrinsic rewards, such as pay, were not as important as certain aspects of intrinsic motivation, such as the desire for intellectual change, in enhancing innovation. These findings have obvious implications for how to best nurture innovation within the workplace. Further research could investigate the part that different aspects of intrinsic motivation, such as curiosity, improving feelings of mastery, self-expression potential, and the resolution of conflicts, play in innovation.

*Key message*
*Innovative people are intrinsically motivated by change. They enjoy solving problems for their own sake such that extrinsic rewards do not necessarily enhance innovation. Motivation is perhaps the single most important antecedent of individual innovation. Leadership and management style significantly influence employee motivation to innovate*

## 1.4 Personality

From several decades of research on the association between innovation and personality, a consistent set of characteristics has emerged. These include imaginative, inquisitive, high energy, high desire for autonomy, social rule independence and high self-confidence. The Five Factor Model (FFM) of personality has become an almost universal template with which to understand the structure of personality. The FFM dimensions include Openness To Experience (ideas, aesthetics), Agreeableness (compliance, straightforwardness), Conscientiousness (order, dutifulness, competence), Extroversion (warmth, gregarious, activity) and Neuroticism (anxiety, depression). Given that the FFM is an appropriate model for charting individual

differences among adult populations, it provides a useful structure to review the literature exploring associations between personality and innovation.

*(i) Openness To Experience*. There is good empirical evidence of a positive association between various characteristics associated with innovation and those used to depict openness (e.g. imaginative, original, flexible, unconventional; Feist, 1998). Research suggests that openness enhances an individual's intrinsic motivation towards novelty and therefore works in a multiplicative way to produce innovation (King et al, 1996). Although there are some inconsistencies in the findings - with recent findings suggesting that the relationship may be moderated by contextual factors (Andrews & Smith, 1996; Burke & Witt, 2002; Baer & Oldham, 2006) - openness is perhaps the most important personality dimensions to predict the propensity for innovation (Patterson, 2002; Batey & Furnham, 2006; Furnham, 1999; Gelade, 1997; Harrison et al, 2006; King et al, 1996; McCrae, 1987; Wolfradt & Pretz, 2001).

*(ii) Agreeableness.* Several studies have demonstrated a negative association between agreeableness and innovation (George & Zhou, 2001; Gelade, 1997; Patterson, 1999). In other words, being more disagreeable is linked to innovation. Empirical studies have confirmed the negative association between innovation and agreeableness by showing that innovators have high social rule independence. These findings are consistent with Eysenck's emphasis on the potentially negative dispositional characteristics of innovators, where innovators are often outspoken, uninhibited, quarrelsome, and sometimes asocial. Related to these findings are results showing that agreeableness is negatively associated with creative achievement but not with creative thinking. Thus, agreeableness is likely to be important in the implementation process of innovation but not for idea generation. This affords intuitive sense in that the implementation of new ideas is likely to be a group effort which involves social processes and activities. Such findings have important repercussions for the selection and management of employees. How do employers reconcile the need for innovative individuals who may display traits that are traditionally viewed as "*difficult to manage*" within an organisation, and the need to select agreeable individuals who are likely to fit within a team and within the organisation overall? The decision to select employees for certain traits should be based on the wider organisational context and the specific needs of the organisation, group, and role under consideration. Implications of such recruitment interventions are considered later in the report.

*(iii) Conscientiousness.* The vast majority of research has demonstrated that lack of conscientiousness is associated with innovation (Barron & Harrington, 1981; Gelade, 1997; Harrison et al, 2006; Runco, 2004). Defined by terms such as fastidious, ordered, neat and methodical, the evidence shows that individuals high on conscientiousness are more resistant to changes at work, and are more likely to comply with current organisational norms. A recent study reported that the negative association between conscientiousness and creativity is likely to be moderated by contextual factors, such as lack of autonomy and support (George & Zhou, 2001). Recent studies have also shown that the facets of conscientiousness that are most closely associated with lack of innovation are being methodical, ordered and dutiful (Robertson et al, 2000).

*(iv) Extroversion.* With regard to the relationship between Extroversion and innovation, findings are not clear-cut. Feist (1999) concluded that introversion is positively associated with innovation. Similarly, many have argued that isolation and withdrawal are necessary conditions for generating new ideas. However, there is little evidence from organisational contexts and more recent research indicates that extroversion is a positive predictor of innovation (Furnham & Bachtiar, 2008; Wolfradt & Pretz, 2001). In meta-analytic studies of occupational work performance in general, extroversion has been shown to be a positive predictor for many occupations. This is particularly the case in large organisations where interpersonal factors are likely to be important for effective job performance (e.g. sales, managers and other professional occupations). The association between extraversion and innovation seems to be context dependent. Introversion is likely to be related to real-life artistic endeavour whereas extraversion seems to predict performance measures of creativity and innovation (Patterson, 2002; Batey & Furnham, 2006). Additional research is needed to empirically explore the association between extroversion and innovation in different sectors and domains.

*(v) Neuroticism.* There is relatively little research examining an association between neuroticism (low emotional stability) and innovation. Of what literature is available, there appears to be some inconsistencies depending on the domain of interest. For example, King and colleagues (1996) found no association between neuroticism and creative thinking or innovation. Conversely, other research literature suggests a positive relationship between neuroticism and innovation. One explanation for these inconsistencies is likely to be that

the association between neuroticism and innovation is domain-dependent. Feist (1998) for example, observed in a meta-analytic review that artists appear to be more anxious, emotionally labile and impulsive than the scientists he studied. A more thorough investigation in this area is necessary, particularly in organisational settings with a broader range of occupations. Some suggest a curvilinear association between emotional stability and performance, (where too much or too little anxiety is detrimental to innovation) and moderate levels of anxiety, for example, can enhance innovative potential. These findings have implications for management practice, particularly at the level of individual departments and projects, and in relation to the role of managers' feedback and support in promoting innovation. Implications for management policies are considered later in the report.

*Key message*
*The most common personality trait associated with innovation is openness to experience. Recent research shows conscientiousness to be a negative predictor of innovation. The influence of other personality traits such as extraversion and neuroticism is likely to be domain/context-dependent.*

## 1.5 Behaviours

With few exceptions, the role of discretionary employee behaviours in enhancing innovation has been vastly underestimated. Contemporary research on *proactivity*, including concepts such as personal initiative and *'voice behaviour'* described later may also provide valuable insights into our understanding of innovative people (Frese, 2000).

Based on work by Frese and colleagues, the concept of personal initiative (PI) describes a class of behaviours that have been positively linked with innovation and entrepreneurial orientation. PI is defined by three main facets of self-starting, proactivity and persistence (see also Patterson, 2004). A self-starting approach is characterized by setting oneself context-specific goals and going beyond formal job requirements. Proactivity implies that an individual anticipates opportunities and problems rather than reacts, and prepares to deal with them before they occur. PI also involves persistence, as this will be required to overcome barriers in reaching one's goal. Frese suggests that these three facets of PI reinforce each other and tend to co-occur. Taking an action based approach, each of the three facets of PI can be used to understand how individuals develop goals, collect information, make plans for executing them, and how individuals gather and use feedback.

Frese and Fay (2001) propose a complex model of distal and proximal factors that influence performance in organisations, whereby environmental supports (such as support for PI, control at work), knowledge, skills and abilities (such as cognitive ability) and personality influence individual orientations (i.e. self-efficacy, handling errors, active coping) which, in turn, influence PI. In this way, PI is conceptualised as a set of active behaviours, and is directly linked to effective performance in organisations.

There is a growing body of research examining the association between PI and innovation. Specifically, the relationship between PI and conservatism in the work place has been studied. Results show that conservatives showed significantly less PI than their less conservative counterparts, were less orientated towards growth and challenge, and were less innovative. In exploring environmental influences on PI, research shows that increases in job complexity and job control can help enhance PI at work (Frese et al, 2007).

Research suggests that PI is particularly important in the idea implementation phase of the innovation process as it involves overcoming barriers and persistence. In a study using path analysis, several predictors were examined including individual level variables (e.g. PI, self-efficacy, interest in innovation), work characteristics (e.g. control, complexity), motives (e.g. reward) and organisational system factors (e.g. supervisor support). Results showed that being proactive, actively involved in one's work environment and confident that one is capable of thinking of good ideas were the most important predictors of innovation (Kickul & Gundry, 2002; Parker et al, 2006; Seibert, Kraimer, & Crant, 2001). Organisational factors were also important variables and the results suggest that innovation is maximised when organisational climates promote an active approach towards work and interpersonal risk-taking. The concept of PI has also been applied at an organisational level. Findings suggest that companies with pro-initiative climates are more innovative and profitable. Climates for initiative may improve an organisation's ability to deal with innovation and change, by encouraging self-starting, proactivity and persistence in employees.

*'Voice behaviour'* is an individual's willingness to speak up with suggestions for change (Van Dyne & LePine, 1998). This form of initiative which involves challenging the status quo is viewed as a behaviour which may play an important role in enabling the implementation of creative ideas. (Rank et al, 2004). Further research is needed to explore whether proactive behaviours may be developed through training (Frese, 2000).

The recent shift of research interest towards group and organisational aspects of innovation has led to the recognition that transferable skills, such as communication skills, are pertinent to the process of innovation, especially for the implementation phase of innovation (Good, et al, 2007). Although individuals are the source of innovations, innovations rarely occur in isolation. In order to innovate, employees often need to relate and interact with other individuals - inside or outside the organisation - hence the importance of communication, articulation, and social networking skills. Other important skills related to an employees' ability to integrate within a team include conflict resolution skills, and collaborative problem-solving skills. Skills specific to leaders and managers, such as the ability to monitor, evaluate and provide feedback are reviewed in more detail in the social resources section. Further research is needed in order to shed light on how innovative employees manage social interactions and on how they integrate social and intellectual demands.

The recognition that individuals' proactivity, *'voice behaviour'*, and communication skills are important antecedents of innovation may have implications for the education system. Awareness of the role and importance of personal initiative may be of use to Educators in order to better nurture the innovative skills of young people and integrate them into the curriculum.

*Key message*
*Studies focusing on the employee behaviours associated with innovation, such as personal initiative and social competence, contribute to our understanding of individual-level innovation, particularly in relation to the implementation stage of the innovation process.*

## 1.6 Emotions & mood states

The examination of the complex relationship between emotions, mood states, and innovation is a new but rapidly growing research area. Whilst a wide range of empirical studies found a link between positive mood states and some aspects of innovation (Isen, 1993; 1999; Amabile, Barsade, Mueller and Staw (2005); Hirt, 1999; Grawitch, Munz & Kramer, 2003; Shalley et al, 2004), job dissatisfaction and negative moods and feelings including emotions like anger and fear have also been associated with creativity, (eg. Anderson & Pratarelli, 1999; Kaufmann & Vosburg, 1997). Recently, George and Zhou (2002;2007) attempted to unravel the complex interplay between mood and creativity. They found that job dissatisfaction, negative affect, and positive moods were all good predictors of innovation attempts when perceived recognition, support, and rewards for creativity were high. As suggested by Verghaegen et al (2005) it is also possible that moods affect creativity indirectly, by means of mood-induced self reflection. In a recently published meta-analysis, Bass and his colleagues (2008) differentiated between mood states according to their hedonic tone, activation level and their focus (prevention versus promotion). They concluded that "*anger and happiness should be cherished, and sadness and relaxation should be frowned upon*" (p.799). Further research on this topic is warranted. Specifically, the relationship between emotions, moods, and their association with different phases of the innovation process deserves more emphasis in future research.

The concept of Emotional Intelligence (EI), defined as "*the ability to perceive accurately, appraise and express emotion; the ability to access and/or generate feelings when they facilitate thought; the ability to understand emotion and emotional knowledge; and the ability to regulate emotions to promote emotional and intellectual growth"* (Mayer & Salovey, 1997), has become very popular in recent years. Some suggest that EI has a positive influence on organisational innovation, both for leaders and individual employees. Specifically, researchers have suggested that employees who show high levels of EI are likely to benefit more from both positive and negative creativity-related feedback (Zhou, 2008). Similarly, leaders' levels of EI are likely to accentuate the employees' inclination to engage in the innovation process (Zhou & George, 2003).

*Key message*
*The association between mood and innovation is complex and warrants further investigation. Emotional Intelligence might be an important requisite for innovation but its role is still relatively unexplored*

## 1.7 Developmental factors

Whilst much is known about the cognitive and dispositional characteristics of innovative individuals, the developmental conditions that influence idea generation and innovation are vast (and difficult to investigate empirically). Some aspects of the family environment and circumstances that some believe promote innovation potential include a supportive and encouraging family, exposure to appropriate knowledge and values within the family environment, birth order, early parental loss, family size, and the availability of role mentors and requisite educational opportunities (Howe, 1999; Mumford, 2002). Whilst some of these factors appear intuitively beneficial for innovation (e.g. availability of role models, exposure to appropriate knowledge), the influence of other aspects, such as birth order and family size are less clear. Family size and birth order are thought to have an impact on the development of innovative potential because of their impact on family processes. Middle-born children for example are usually more rebellious, hence their potentially increased propensity to innovate (Gaynor & Runco, 1992). The influence of some developmental aspects, such family background and structure, is likely to depend in part on the specific field in which creativity arises. Simonton (1988) for example, suggests that exceptionally creative individuals active in domains in which the process is much more unconstrained, such as the arts, will most likely emerge from less conventional and stable family backgrounds. Innovative potential in other domains, such as the sciences, may require higher levels of educational achievement, and more stable family backgrounds. These are important societal issues and although research in this area is mounting, we have scarcely begun to answer the question of what developmental conditions are needed to nurture innovative people.

*Key message*
*The influence of some developmental aspects on innovation, such family background and structure, is likely to depend in part on the specific field in which innovation arises. The study of developmental influences on innovation is a new burgeoning area of research with many answered questions*

# 2. Work environment

Researchers have consistently identified several characteristics of work environments that are influential in promoting innovation**.** In general, research shows that a supportive and stimulating work environment enhances idea generation and innovation. Various other resources contribute to providing a supportive and stimulating work environments including, amongst others: supportive management practices and leadership, constructive evaluation and feedback, and supportive and stimulating co-workers.

## 2.1 Organisational ambidexterity

The concept of organisational ambidexterity is typically viewed as an organisation's *ability to simultaneously pursue exploration and exploitation*. Exploration is associated with search, experimentation, divergent thinking and variation whereas exploitation is linked to efficiency, convergent thinking, refinement and improvement. Some researchers view contextual ambidexterity as a firm's ability to simultaneously focus on alignment in their management of current business needs whilst being capable of quickly adapting to meet changing demands in the environment. Other studies have looked at structural organisational ambidexterity, linking exploration and exploitation with different types of innovation. Tushman and O'Reilly for example defined ambidexterity as the "*ability to simultaneously pursue both incremental and discontinuous innovation*" (Tushman and O'Reilly, 1996; p.24).

Although several typologies of innovation exist, one of the most established classifications of innovation distinguishes between incremental or radical/discontinous innovations (Daft & Becker, 1978; Damampour & Gopalakrishnan, 1998; Hage, 1999; Knight, 1967; Normann, 1971). Incremental innovations involve building on and reinforcing "*the applicability of existing knowledge*", whereas radical innovations "*destroy the value of an existing value base*" (Abernathy & Clark 1985; p.5). Several researchers have argued that organisations must rely on processes and systems that facilitate dual capacity behaviours which focus both on exploitation and exploration activities (e.g. Heldlund & Ridderstrale, 1997; Gibson & Birkinshaw, 2004). Adler and colleagues (1999) identified two organisational mechanisms that empower employees to make their own choices in an ambidextrous organisational context: routines aimed at rendering creative activities systematic and job enrichment schemes which positively influence employees' flexibility and innovative potential. Tushman and O'Reilly propose that innovation within organisations requires coping with the conflicting goals of building on the past and defining the future and that the key elements of these paradoxical aims are a decentralised organisational structure, a shared vision and culture, and flexible and supportive leaders and managers. A *shared vision* seems to enable teams to manage the paradox of combining exploratory and exploitative innovation; it enhances team members' ability to resolve conflicting agendas (O'Reilly & Tushman, 2004) and to produce opportunities for exchanges across exploitation and exploratory units (Tsai & Ghoshal, 1998).

Gibson and Birkinson (2004) found that leaders play a key role in fostering ambidexterity by encouraging a supportive organisational context characterised by *discipline*, *support*, *stretch*, and *trust*. Recently, Jansen and his colleagues (2008) analysed the role that senior team attributes (shared team vision, contingency rewards, social integration) and a transformational leadership style play in facilitating ambidexterity. They found that a shared vision, shared values, collective aspiration and goals, and contingency rewards are key influences for organisational ambidexterity. According to Jansen et al, transformational leaders provide the intellectual stimulation required for openly discussing and reconciling conflicting demands within teams.

*Key message*
*Ambidexterity, a firm's ability to simultaneously pursue exploration and exploitation, requires a set of complex individual and organisational characteristics. These include enriched jobs, a shared vision and culture, trust, discipline, and flexible and supportive leaders*

## 2.2 Social resources

Early studies tended to focus on identifying the individual traits and characteristics associated with innovation. There is now general consensus that an individual's knowledge, intelligence, personality and intrinsic motivation are the key substrates for innovation potential. However, since we are exploring innovation in organisations, this necessarily involves *social* activities (eg. gaining resources, influencing others). Here we argue that innovation in organisations arises from the combined efforts of various individuals and/or within a social environment. More recently, there has been a shift towards researching the various factors influencing team and work-group innovation. For example, Anderson and Gasteiger (2007) presented an overview of research in the field of creativity and innovation in organisations, highlighting possible policy implications on innovation in the Netherlands. Their overview focuses on individual and group-level innovation, with a particular emphasis on team innovation. Several recent literature reviews have been devoted exclusively to exploring the association between teamwork and innovation (e.g. West et al, 2004). By contrast, the impact of other social resources, such as leadership, has received relatively little attention. The vast amount of research on leadership in general has tended to focus on the relationship between leadership and change, rather than on the specific associations between leadership and innovation. Our recent research (e.g. Port & Patterson, 2006) suggests that identifying the managerial capabilities to enhance employee innovation is a fruitful avenue for further research. In addition, researchers are now exploring the role of social networks in fostering innovation in organisations.

### 2.2.1 Teamworking, dissent and conflict

Several team characteristics that are related to innovation have been identified including; (i) operating principles in groups; (ii) diversity, dissent and minority group influence; (iii) group development over time; and (iv) group climate.

*(i) Operating principles:* King and Anderson (2002) highlight the differences between '*organic'* and '*mechanistic*' group structures in their discussion of operating principles. An organic group structure is characterised by loose boundaries of authority and responsibility and a propensity to work as a group, rather than breaking projects down into discrete tasks for individuals. Conversely, mechanistic groups are typified by being rule bound, hierarchical and formal in operation. Organic group structures tend to be more innovative, since autonomy and freedom are enhanced. Work-group autonomy is an essential ingredient of innovation (West, et al, 2004; Bailyn, 1985; West, 1987) and it is most effective when combined with unambiguous goals and objectives from management. Autonomy is important for idea generation and mechanistic forms of organising may have a role in co-ordinating the implementation of ideas. As a consequence, it may be that different group structures may be needed to complement the different stages of the innovation process.

*(ii) Diversity, dissent and minority group influence:* Groups consisting of people with a wide variety of backgrounds and perspectives are more likely to consider a wider variety of approaches to tasks. Team members who draw upon different knowledge and skills, disciplinary orientations or professional backgrounds are likely to be better at generating and implementing new ideas, as long as they are given sufficient time to integrate different perspectives and approaches (Watson et al, 1993). Heterogeneity in terms of attitudes, gender, and education (e.g. Shin & Zhou, 2007) is also associated with enhanced group innovation. However, research suggests that too much demographic diversity will increase the likelihood of conflict within a group, which could have negative consequences for productivity (Gonzalez-Roma & West, 2003).

In the 1980s Tjosvold introduced the concept of '*constructive controversy*', which indicates the value of social interaction and specifically, controversy in decision making. Constructive controversy occurs where team members believe they are in co-operative environment (emphasising mutually beneficial goals rather than a '*win-lose'* solution, where they feel their personal competence is acknowledged and where members use processes of mutual influence rather than attempted dominance). Constructive task-related controversy is likely to enhance innovation within teams.

Research clearly demonstrates that accepting and encouraging the expression of *minority views* (and dissent) in groups and organisations are important stimuli for creativity and innovation (De Dreu & West, 2001; West, et al, 2004). Conversion to a minority view in groups is most likely to occur when the minority is consistent and confident in presenting arguments. A behavioural style of persistence is most likely to promote attitude

change and influence over the majority. The minority group must reflect a visible commitment to the norms, values and interests of the majority in order to gain influence.

High levels of *conflict* have been shown to be both beneficial and detrimental for creativity (Carnevale & Probst, 1998). One explanation for seemingly contradictory findings about the association between conflict and creativity has been advanced by De Dreu and Nijstad (2008). In a laboratory-based study, the researchers provided support for the assumption that high levels of conflict stimulate creativity in domains related to the conflict but hamper creativity in domains unrelated to the conflict. It is also possible that the type of conflict moderates the relationship between controversy and creativity or innovation.

Researchers have recently identified three different types of conflicts: (a) *relationship conflict*; members have controversial personal issues, such as dislike; (b) *task conflict*; relates to diverse viewpoints and opinions about a task, and (c) *process conflict*, which relates to the awareness of different viewpoints on how to accomplish a task, including spreading of resources and responsibilities. Researchers can only speculate on whether different forms of conflicts may come into play at different stages of the innovation process (Shalley, 2002). In summary, one could conclude that moderate task-related conflict and minority dissent, along with high levels of participation, are likely to be beneficial for innovation. Most researchers also agree on the importance of group integration skills, such as the ability to manage conflict in a cooperative context (West et al, 2004; Shalley, 2002). Tjosvold (1998) suggests that managing team conflict effectively results in greater feelings of participative safety amongst team members.

*(iii) Group development over time:* The limited literature in this area suggests that the longer the group is together the less innovative they become as teams grow to be habit bound and more resistant to change. Work groups do not come together and develop over time in a vacuum. Initiating change in an organisation may not be possible if this occurs at a peak time in an organisation's annual cycle of activity. The concept of '*entrainment*' has been used to explain that cycles of activities are paced by the numerous other cycles. In applying this concept to work environments in organisations, an '*entraining process*' suggests there are 'windows of opportunity' where the timing of the formation of a project group (or another intervention in an innovation process) can be critical to its longer term success.

*(iv) Group/team climate:* In the 1990s, West and Anderson proposed a four-factor model of team climate. This model suggests that group innovation is related to four factors: (a) *Participative safety*; members feel psychologically safe in proposing new and improved ways of doing things and all participate in decision-making; (b) *Vision*; the team's goals and objectives are clearly defined, shared, attainable and valued; (c) *Support for innovation*; the expectation, approval and practical support towards group members' attempts to introduce new and improved ways of doing things in the work environment; (d) *Task orientation/Excellence*; the commitment of the team to achieve the highest possible standard of task performance, using constructive progress monitoring procedures. There is good evidence to support the existence of these four factors in relation to group climate and there exists a Team Climate Inventory as a measure of these dimensions. Groups with a clearly defined and shared vision and goals are more likely to develop new working methods and processes, because their efforts are focused and have direction.

Studies of teams in different organisational contexts show that participation in decision-making is important as it increases the likelihood that group members commit to decision outcomes, and will be willing to offer new ideas (Borrill et al, 2000; Burningham & West, 1995; Carter & West, 1998; Poulton & West, 1999; West & Richter, 2008). In addition, innovation requires group commitment to achieve high task performance, and requires members to offer articulated and enacted support for innovation attempts. A variety of studies based on hospital management teams (West & Anderson, 1996), in primary health-care and community mental-health (Borrill et al, 2000), and in TV production (Carter & West, 1998) have demonstrated a link between team members' support for innovation attempts and group innovation. West, et al (2008) identified six climate factors which influence innovation at the group level, including clarifying and ensuring commitment, participation in decision making, managing conflict and minority in a constructive manner, supporting innovation, developing intragroup safety and trust and reflexivity. Psychological safety is a relatively new concept which relates to "*a shared belief held by members of a team of interpersonal risk-taking*" (Edmondson, 1999; p.350). Several researchers have highlighted that a climate of psychological safety is conducive to innovation.

*Key message*
*A variety of team characteristics have been identified as antecedents of innovation within organisations. These include operating principles (organic structure, autonomy), team climate (vision, participative safety, task orientation, support for innovation), team structure (diversity), team processes (participative decision making, minority influence, constructive controversy, intra-group safety) and team member characteristics.*

### 2.2.2 Leader characteristics

Many researchers have suggested that leaders' behaviours and dispositional characteristics have a profound influence on the innovation process and some have identified leadership as the single most important aspect of organisational innovation (Tierney, 2008). However, there has been relatively little primary research in this area (see Port & Patterson, 2006). Since the early 1980s, several independent studies have identified a range of leadership behaviours that enhance employee innovation. These behaviours include *encouragement of risk-taking*, an *open style of commun*ication, *participative* and *collaborative style*, *giving autonomy* and *freedom*, *support* for innovation (verbal and enacted), *constructive feedback*. Janssen (2005) found that employees are more likely to use their influence to carry out innovative activities when they perceive their supervisors as being supportive of innovation. Research shows that support from managers can come in a variety of forms. Mumford and colleagues (2002) distinguish three forms of leadership support (*idea*, *work*, and *social*) that enhance employee motivation and innovation. Similarly, Amabile et al (2004) concluded that *instrumental* (task or technically related) and *socioemotional* support promoted employees creativity. Port and Patterson (2006) also identified managers being *optimistic* about the future of the organisation as another key factor influencing the propensity for employees to innovate.

Can it be assumed that the dispositional characteristics associated with employee innovation can be transposed to the role of leader, whether the leader is a direct line supervisor or a chief executive of an organisation? Predictably, the research suggests the answer to the questions is yes - partly. There is evidence for example that some aspects of cognitive ability, such as general intelligence, adaptive problem-solving skills, planning ability (operationalised as the ability to identify, anticipate problems and solutions) are important in leading for innovation. Similarly, some have argued that Emotional Intelligence is an important requisite as it may influence both the ability to provide feedback and the way feedback is perceived. Studies have also provided support for the value of professional and technical knowledge in leading for innovation. Motivation is likely to be a key resource required by leaders to foster innovation but little research has investigated the effects of leaders' motivation on innovation within organisations. One exception is a study by Tierney (1999), which showed that supervisors' intrinsic motivation promoted employee innovation only when the employees were intrinsically motivated themselves. An additional disposition linked with the ability to foster innovation is leaders' awareness and sensitivity towards the temporal complexities and cognitive demands that different stages of the innovation process place on employees.

### 2.2.3 Feedback

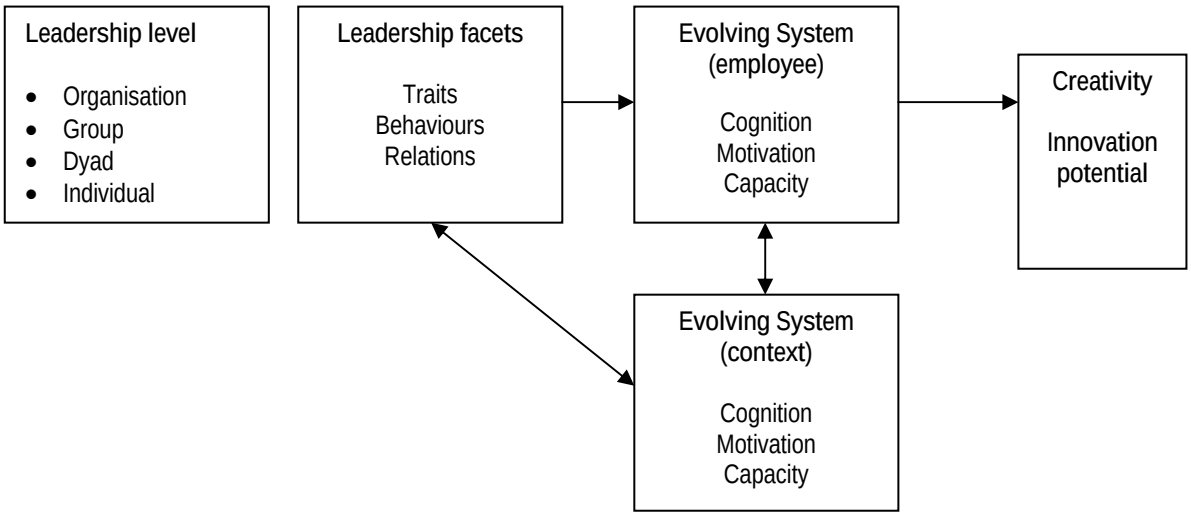
Research clearly shows that creativity related *feedback* has a profound impact on the propensity to innovate. Zhou (2008) provided a framework for examining the theoretical basis behind the value of *creativity-based feedback* for promoting creativity. The multidimensional framework depicts aspects of employee characteristics (ie achievement motivation, power motivation, EI of feedback provider (knowledge, expertise, seniority, status) interacting with feedback content and delivery style (task versus person focused; developmental) and affecting several psychological mechanisms such as intrinsic motivation, the understanding of creativity standards, and the acquisition of creativity related skills and strategies. Findings related to these various aspects of feedback have direct implications for the management of innovation. In an earlier study, Zhou (1998) reports that informational feedback is associated with higher subsequent creativity than feedback delivered in a controlling or punitive manner. A related finding is that employees' level of innovation can benefit from leaders acting as role models for creativity. Research indicates that organisational innovation is influenced by a leader's vision and creative goal setting. Unfortunately, most studies have focused on one or two management behaviours resulting in a lack of integration of results. Further, many investigations have focused solely on either idea generation or implementation of ideas and so clarity has been difficult to achieve. This is an area that warrants further research.

### 2.2.4 Leadership roles

Anderson and King (1991) propose a contingency model to understand the role of leadership in relation to four phases of the innovation process; (a) *Initiation*, leader is nurturing, supportive, encouraging ideas, open-minded and non-judgemental; (b) *Discussion*, leader obtains opinions, evaluates and agrees plans; (c) *Implementation*, leader sells the solution to all stakeholders, designs plans to include stakeholders, gains commitment plans, (d) *Routinization*, leader checks effectiveness, modifies and refines. Therefore, the model highlights the notion that leaders need to be flexible in their approach and employ different styles according to the different phases of the innovation process.

Tierney (2008) recently developed a model of the *leadership role* in creativity which encompasses several conceptual frameworks identified in previous research. Tierney describes several aspects of leadership that influence two systems in organisations: the *individual* and the *context*. The model, which is reproduced below, highlights the complexity of leadership influences in organisations and the interaction between leadership *facets* (traits, behaviours, relations), leadership *levels* (organisation, group, dyad, individual), and the cognition, motivation, and capacity of both the individual and the context. Tierney suggests that in order to fully comprehend the association between leadership and innovation within organisations one must consider the complexity of the relationships and the interactions between the aspects included in the model. She argues that the model facilitates the identification of research gaps where for example, Tierney (2008) highlights that most of the existing literature on leadership for innovation has focused on supervisors, at the expense of more senior leadership roles. Similarly, despite the recognised importance of innovation leadership and of the role that individual characteristics play in the innovation process, rigorous research on the dispositional characteristics of leaders which are conducive to innovation is still relatively scarce.

**A model of leadership for innovation** (adapted from Tierney, 2008)




### 2.2.5 Leadership style

When examining the contingent relationships between leader and employee, the *quality of the leader-member-exchange* (LMX) predicts the propensity for innovation. Leaders naturally develop social relationships with each member of a work group which can be characterised by a high quality or low quality, where a pattern of social exchanges emerges. In 1999, Tierney demonstrated that a high quality LMX predicts employee innovation, since employees engaged in more challenging tasks receive more resources and rewards for innovation. In recent studies, *job self-efficacy* has been shown to be the strongest predictor of *creative self-efficacy*. This implies that managers, in order to enhance employee innovation, need to provide the necessary training and feedback to enhance employee confidence and mastery.

Research has recently shifted its attention from the behaviours of leaders towards the processes of leadership. Recent theories of leadership describe two styles including a *transformational* style (inspiring and motivating others to achieve a shared vision) and a *transactional* style (influencing others through contingent rewards and punishments). The conceptual distinction between the two styles does not prevent managers from showing

behaviours related to both styles and leaders may use a combination of transformational and transactional leadership. A great deal of attention has been focused on the link between transformational leadership and innovation. Some researchers argue that a transformational style of leadership is likely to enhance both employee and group innovation and that transformational leaders play a decisive role in motivating employees whilst providing idea, work, and social support. However, in a review of leadership in innovation, Mumford et al (2002) concludes that the association between transformational leadership and innovation is not that clear. While some studies show that transformational leadership is positively related to creativity and innovation (e.g. Sosik, 1997), other research has failed to find a significant relationship (e.g. Jaussi & Dionne, 2003). One argument is that rather than examining whether there is a direct association between transformational leadership and innovation, researchers should identify the impact of this leadership style and the associated behaviours on related factors that have been shown to promote innovation. Consistent with this claim, Jung and his colleagues (2003) found that a transformational leadership style in top leaders promoted a work environment supportive of innovation and job empowerment amongst employees.

Most of the available research on the link between leadership and innovation focuses on effective leadership; Amabile (2003) identified several ways in which leadership acts to stifle the propensity to innovate. Specifically, whilst consultation promotes feelings of leaders support, the negative form of monitoring, often expressed as the 'micromanagement of subordinates' work, can have detrimental effects on feelings of leaders' support. Similarly, failing to address difficult problems (technical or interpersonal) and giving assignments which do not fit well with the employee capability or responsibility, are both related to diminished feelings of leader support. A recent survey by McKinsey also supported the relationship between leadership capabilities and perceived organisational innovation. Those who reported their leaders capability as 'strong' or 'very strong' also described their own organisation as more innovative that others in their industry (Barsh et al 2008)

*Key message*
*Leaders play a decisive role in fostering and nurturing innovation within organisations. Traits that have been specifically related to the ability to lead for innovation include intelligence, planning ability, problem-solving skills, and Emotional Intelligence. Important leader behaviours include encouragement of risk-taking, an open style of communication, participative and collaborative style, giving autonomy and freedom, support for innovation (verbal and enacted), constructive feedback, and being optimistic about the future.*

### 2.2.6 Social networks

The topic of social networks has been relatively neglected until recently. The view that internal and external social networks (i.e. content, strength and density) can facilitate team effectiveness and innovation performance has become recently more widespread (Balkundi & Harrison, 2006; Perry-Smith 2006). It has been suggested that the contact with heterogeneous social circles should foster innovation. Specifically, the exposure to a variety of approaches and perspectives within or outside a group is likely to facilitate cognitive processes related to creativity and innovation, such as divergent, autonomous, and flexible thinking.

First introduced by Lane and Wenger (1991) in the context of situated learning, communities of practice (groups of people who informally share, develop, and diffuse knowledge, learning, and practice), are increasingly viewed as potential contributors to innovation. Recognising the existence of such practices and allowing them to develop and evolve is important for innovation to occur. The importance of communities of practice must be taken into account when considering the role of management, work design, and organisational culture. Communities of practice focused on innovation tend to differ from the ones oriented towards efficiency: as well as generally showing a high degree of autonomy, they are often characterised by an external focus and by top-down processes.

*Key message*
*The content, strength and density of social interactions within & outside the organisation influence innovation*

## 2.3 Work Design

### 2.3.1 Job characteristics

A key finding in the research literature is that jobs designed to be *complex* and *demanding* (eg jobs with high levels of *autonomy*, *task challenge*, *feedback*, *significance*, *identity*, *task* and *skill variety*) are positively associated with creativity and innovation (Oldham & Cummings, 1996; Shalley et al, 2004). Specifically, the way jobs are designed has been shown to influence employees' intrinsic motivation and self-efficacy. In a recent study Parker and her colleagues (2006) showed that empowering the workforce by giving employees more job autonomy had a long-term impact on proactive work behaviour, including self-implementation of ideas and proactive problem solving. Job autonomy influenced proactive behaviour directly and indirectly via self-efficacy and flexible role orientation (employees' perceptions of own job role and long term roles). Co-worker trust and a proactive personality were also found to contribute to proactive behaviour. Another facet of a job which has recently been shown to influence employees' motivation to innovate is the perceived creativity *requirement* of the job. When employees perceive that they need to be creative in order to perform the job well, because it is part of the job requirement, they are more likely to take risks and to be creative (Shalley et al, 2000; Unsworth et al, 2005). In addition, research indicates that perceived support for job creativity is positively related to job satisfaction and can alleviate role job stress (Stokels et al, 2002).

*Key message*
*Complex, demanding jobs where a requirement to be innovative is made explicit significantly enhances the potential to innovate*

### 2.3.2 Job demands

Research shows that moderate job demands and time pressure are likely to predict individual innovation. In a series of studies involving health workers West and his colleagues found that high job demands were positively associated with individual innovation (Bunce and West, 1995; West, 1989). However, high job demands have a detrimental impact on job satisfaction, stress levels and turnover. More recently, Baer and Oldham (2006) investigated the relationship between perceived time pressure and employee creativity. They reported that the association between time pressure and creativity followed an inverted U-shaped function for employees who received high support for creativity and scored high on openness to experience.

*Key message*
*Moderate levels of job demands and time pressure are likely to predict individual innovation*

### 2.3.3 Physical resources

A stimulating physical environment can influence work processes to enhance innovation. In the 1920s Wallas proposed a phase model of creativity which distinguishes between several phases: preparation, incubation, insight, and finally elaboration and evaluation. Kristensen (2004) applies concepts of spatial embodiment (i.e. value creation, scaffolding, imagination, and materialization) to describe how the workplace physical context (i.e. space) can facilitate the various phases of the innovation process identified by Wallas. For example, space that maximises access to information can enhance individuals and teams' innovative potential, especially in relation to the preparation and incubation stages of innovation. Likewise, office space designed around circular structures and radial shapes, with clusters and grids, is likely to foster different aspects of the innovation process. Kristensen provides a case example of a large company which deliberately use physical space to enhance innovation.

In their ethnography of arbitrage in a Wall Street trading room, Beunza and Stark (2004) highlight the importance of office layout in fostering innovation. They argue that the presence of large, open-plan space, with clusters of employees holding different jobs, is a driving force behind innovation. However, they propose that knowledge must be shared beyond the office space, via multiple communication channels, to enhance innovation potential.

Some organisations have purpose-built innovation laboratories or Creative Retreat Centres that make use of various technologies and features such as computer-generation tools (eg. electronic brainstorming software (EBS)), whiteboards, expert facilitators, virtual technologies, PCs/laptops, internet access, idea elicitation tools (eg. pictures, leg-style toys), or unconventional architectural designs. Recent studies (e.g. Magadley, Birdi & Patterson, 2005, 2006, 2007; Patterson et al, 2006) have shown that *Creativity Retreat Centres* can significantly enhance the potential to innovate. Using EBS in groups can significantly enhance the quantity of ideas produced as it reduces some of the negative social factors in paper-based group brainstorming, such as evaluation apprehension (members withhold ideas as they fear negative evaluation), and free riding (where members rely on others to accomplish the task).

*Key message*
*A stimulating physical environment, which may include purpose-built innovation laboratories or Creative Retreat Centres, can provide work processes that enhance innovation*

## 2.4 Organisational resources

Several factors facilitate or inhibit innovation at the organisational level of analysis including: structure and size, climate and culture; resources; rewards and incentives.

### 2.4.1 Structure & size

There are three main aspects regarding the influence of organisational structure on innovation including centralisation, formalisation and complexity. *Centralisation* refers to the extent to which authority and decision making lies at the top of a hierarchy. Early research suggests that centralisation and strong hierarchy are detrimental for innovation (Burns & Stalker, 1961). Centralisation is believed to hinder innovation as it restricts information flow and communication. Conversely, decentralisation gives rise to greater participation, allowing more viewpoints to be considered during idea generation. However, research also indicates that centralisation may be important for the implementation stage of innovation (Zaltman et al, 1973). In a more recent review, West and Richter (2008) suggest that decentralisation at local level may promote the propensity to generate ideas (creativity) whereas centralisation may be necessary for the effective implementation of ideas. The use of cross-functional teams in large organisations may represent a solution to this paradox. It is possible that failure to recognise this paradox may be partly to blame for low levels of innovation in some organisations. A further concern is that much of the research here is based on isolated case studies such that reaching broad generalisations to inform policy can be problematic.

*Formalisation* is the degree of emphasis placed on rules and procedures. High formalisation inhibits innovation as it prevents organisational decision makers from seeking new sources of information and making changes at work. However, procedural guidelines and regulations can enhance the successful implementation of new ideas.

*Complexity* is the degree of occupational specialisation in the organisation and is believed to enhance idea generation, and inhibit idea implementation. High complexity is likely to provide a diverse range of information sources during idea generation, but such diversity could accelerate the potential for conflict during the implementation phase. Since innovation is a multi-faceted process, some organisational variables important to enhance idea generation may be counter to promoting idea implementation.

The association between *organisational size* and the propensity to innovate is not clear. Whilst some claim that increased organisational size enhances innovation as there is greater access to resources through economies of scale, others have indicated that smaller firms are likely to be more alert to innovations (Rogers, 1983). It is possible that the relationship between organisational size and innovation may be mediated by a host of factors at the level of individual, group, organisational level and indeed, various external factors depending on the sector. Organisational size for example is linked to resource availability (which promotes innovation), integration of communication and knowledge sharing (as size increases work processes often become more fragmented and so innovation is hindered). In terms of organisational longevity, it seems that

younger firms are viewed as more malleable and find it easier to innovate than organisations who have established for a longer period of time (West & Richter, 2008).

*Key message*
*The relationship between organisational structure and innovation is not straightforward. Structures that may be conducive to the generation of ideas may inhibit implementation and vice versa. It is possible that decentralisation at local level may promote the propensity to generate ideas (creativity) whereas centralisation may be necessary for the effective implementation of ideas*

### 2.4.2 Climate and culture

Innovation at the individual, team, and organisational level can be affected by the *organisational climate* (i.e shared perceptions of the work environment), and/or *organisational culture* (ie shared meanings, values, attitudes and beliefs). Climate and culture are important antecedents to creativity and innovation to the extent to which risk taking and idea generation are encouraged. Surface manifestations of culture include organisational structure, job design, rewards and incentives, informal practices such as norms, espoused values and rituals, stories, jokes and jargon, and the physical environment. Supportive and challenging climates encourage innovation whereas environments characterised by distrust, personal hostilities, limited autonomy and unclear work goals inhibit the implementation of ideas. Organisational support for innovation is characterised by support for members pursuing new ideas, and encouragement of innovation through both words and deeds. The espoused expectations and organisational values in relation to innovation (such as openness to change and willingness to experiment with ideas) are likely to have a major influence on employee behaviour. Amabile and colleagues (2005) noted that organisational encouragement is a vital aspect of a work environment for innovation including; (a) *encouragement of risk taking* and a valuing of innovation from the highest level; (b) *fair* and *supportive evaluation of ideas*; (c) *reward* and *recognition* for innovation; (d) *collaborative idea flow* across the organisation, and; (e) *participative management* and *decision making*.

Research shows that an organisational climate can build a perceived need for innovation. Setting *innovation goals* at both team and individual level is one way to signal that innovation is valued, and innovation can be incorporated in performance management systems. Csikszentmihalyi (1999) argues that innovation needs to be considered within a complex social system made up by the domain, field and person. Thus, organisations have gatekeepers, who can make decisions about which innovations are worth supporting (without being too accepting or too conservative with regards novelty). Organisational practices that positively influence innovation include flexible employment contracts and knowledge management systems, whereas practices that seek to control employees serve to inhibit innovation cultures.

The external *reputation* of the organisation can also influence innovation since innovative organisations may be more likely to attract individuals with a high innovation potential. The information flow in and out of organisations will influence innovation to the degree to which there is an active search of the environment for new ideas.

A recent article by Lipponen and colleagues provides support for the notion that personal values and organisational identification interact in predicting employee suggestion making within organisations (Lipponen et al 2008). The authors found that identification with the organization motivates employees who value openness to change to make suggestions for changes at the workplace. A note of caution on the value of suggestion schemes is warranted. Suggestion schemes, also known as idea capture schemes, are not always highly regarded by employees; there is some evidence that any impact that they may have on innovative performance is often short-lived. Research on the value of such schemes remains scant. One exception is a study by Leach et al (2006) who studied the value of different suggestion schemes types and design features. They found that whilst the perceived effectiveness and suggestion rate of suggestion schemes is dependent on management support, feedback, planning, reward, and publicity associated with the scheme, management support is the only design feature which directly predicts the implementation of ideas.

*Key message*
*An organisational culture that supports innovation encourages risk taking and the exchange of ideas, promotes participation in decision making and management, has goals and rewards for innovation, and provides psychological safety in relation to making suggestions.*

### 2.4.3 Resources allocation

In general, availability of resources is positively related to innovation since resources are needed to develop ideas. However, beyond a certain threshold more available resources do not significantly increase the likelihood of innovation. Researchers have observed concept of 'escalation', where there may come a point when so much invested that it is too costly to stop the implementation process.

Some evidence suggests that mergers have been shown to reduce potential for innovation as resources are focused on managing structural changes to enhance amalgamation. Conversely, alliances and joint ventures between competitors or between customers and suppliers can enable organisations to combine resources and knowledge, and therefore promote innovation and product development.

*Key message*
*Adequate resources are required for innovation but there appears to be a ceiling effect, where more available resources do not significantly increase the potential to innovate.*

### 2.4.4 Incentives & rewards

Whilst the value of intrinsic motivation for innovation is beyond doubt, recent research indicates that extrinsic rewards, such as bonuses, pay increases, awards, and promotions, may also influence innovation. Rewarding employees' attempts at being creative and innovative, as well as actual innovation outcomes is likely to facilitate innovation. Abbey and Dickson (1983) found rewards for recognition of performance and the willingness to experiment with ideas were important facets of the climate of innovative R&D units. Eisenberg and Cameron (1996) found support for the notion that extrinsic rewards positively affect the implementation phase of the innovation process at the individual level. One argument is that extrinsic rewards are detrimental to innovation only when they result in the employee focusing on the reward rather than on the task. However, most of the research on the influence of rewards on innovation has been conducted in the laboratory and here, contradictory results have been published. Thus, there is a need to further investigate the value of different types of rewards and their implications for various phases of the innovation process in field based studies.

*Key message*
*Intrinsic rewards are a crucial aspect of individual innovation. The impact of extrinsic rewards on employee motivation varies according to the type of extrinsic rewards offered*

### 2.4.5 Psychological contract

Since the early 1990s considerable attention has been given to the *psychological contract* in organisational research. The traditional psychological contract is generally defined as an offer of job security for the employer in return for the employee providing commitment. Nowadays, with the impact of globalisation and the recession, employers are no longer able to offer job security. A new deal is thought to have replaced the traditional psychological contract. This new informal contract is said to rest on an offer by the employer of *fair pay and treatment*, plus opportunities for *training and development*.

People management practices are likely to influence the state of the psychological contract. The state of the psychological contract and employees' job satisfaction deteriorate when employers fail to keep promises and to deliver on commitments. This is especially true when managers are responsible themselves for breaches, e.g., where employees do not receive promised training, or performance reviews are badly handled.

Hall and Mirvis (1995) suggest that the new psychological contract implies that the individual turns in a strong performance while continuously learning and adapting and in exchange the organisation offers *meaning and purpose*, *developmental relationships*, and good *rewards and benefits*. Hence organisations need to offer a work environment that not only support *employee development* (a key element of a new contract) but also provide an atmosphere that encourages managers to care for their people.

Although research on the importance of the psychological contract has traditionally investigated the relationship between performance management practices and traditional individual performance outcomes (e.g. turnover), the literature on employee resources for innovation indicates that training and developmental opportunities are also key antecedents of innovation. Hence, organisations should offer opportunities for continual growth, increased skills and abilities, and personal and professional development (i.e. employee or career development opportunities).

# 3. Innovation processes in organisations

## 3.1 Mapping people relevant resources to the innovation process

Here we address a critical question: "*What are the processes through which employee innovation arises*?"
Early research comprised stage model approaches to innovation, where authors have attempted to identify the sequence of activities during the innovation process. Zaltman et al's (1973) stage model of the innovation process is perhaps the most widely cited. The model suggests two main phases (initiation and implementation), with various sub stages in each. The initiation stage involves the sub-stages of knowledge awareness, formation of attitudes and the decision to adopt or abandon. During the implementation stage, ideas are trialled and eventually the innovation is sustained and routinised. Although this research emphasises that the innovation process is multi-faceted, stage-based approaches have been criticised on the basis that they often lack observable supporting evidence. Innovation processes may share some common features, but these are not easily identifiable as discrete stages, occurring in a linear fashion.

During the 1990s, Andrew Van de Ven and colleagues studied the innovation process in depth, using empirically grounded observations. Their studies comprised the Minnesota Innovation Research Program (MIRP), captured in detail in *The Innovation Journey* (Van de Ven et al, 1989; 1999). This program encompassed several organisation-based longitudinal studies of a diverse collection of innovations, observed in real time. The research concluded that the innovation process is best characterised as a ***'non-linear dynamic system'***. In this way, the system comprises a complex cycle of divergent and convergent activities that may be repeated over time at various organisational levels, and are shaped by forces such as resource supply, leadership behaviours, the organisational culture and so on. Although the research concluded that innovation is a non-linear process, by comparing case histories of various innovations, the MIRP studies identified patterns of commonality in innovation processes. These are the initiation, developmental and implementation phases of the innovation. Each phase is described in Figure 2 below.

Research demonstrates that different types of innovation may have varying antecedent factors. Further, the evidence suggests that not all the elements of the innovation process are the same across different innovations. For example, in exploring differences incremental and radical innovation processes, King (1992) showed that sequential, linear models were most applicable for *incremental* innovations whereas *radical* (revolutionary) innovations were characterised more by convoluted, iterative patterns of development. Innovation processes do not occur in a vacuum, where current organisational practices can shape the process, particularly during the implementation phase. To illustrate this perspective, King and Anderson (2002) highlight the concept of '*exnovation'*. This concept was first introduced by Kimberly, (1981) who described innovation as a series of processes which in combination define an 'innovation life-cycle'. The final process of the model is exnovation, where the organisation must discard existing practice associated with a previously implemented innovation, thereby allowing the adoption of a new innovation, where the life cycle starts again.

Expanding on our framework of employee resources for innovation, we present a framework in Figure 2 which indicates how the employee resources for innovation can be best matched to different stages of the innovation process. The framework presented here builds on the process perspective of innovation advanced by Van de Ven (1999); it arises from a variety of theoretical arguments raised in the literature (e.g. Anderson) and examples from the literature. In the framework presented here, the innovation process is conceived as comprising: 1) *problem/opportunity identification* (either by individuals, group or organisations); 2) *initiation* and *idea-generation*; 3) *development* and *exploration*; 4) *implementation*; the process of establishing the value of the innovation; and 5) *exnovation*. A key feature of this framework is that it does not assume a simple left to right sequence of activities. While some employee resources potentially influence all aspects of the innovation process, there is some evidence that some resources are associated more strongly with certain phases of the process. Our framework shows where some of the employee resources are likely to be most influential in the innovation process. Some of the studies that have attempted to investigate the relationship between various antecedents of individual innovation and different stages of the innovation processes are outlined below.

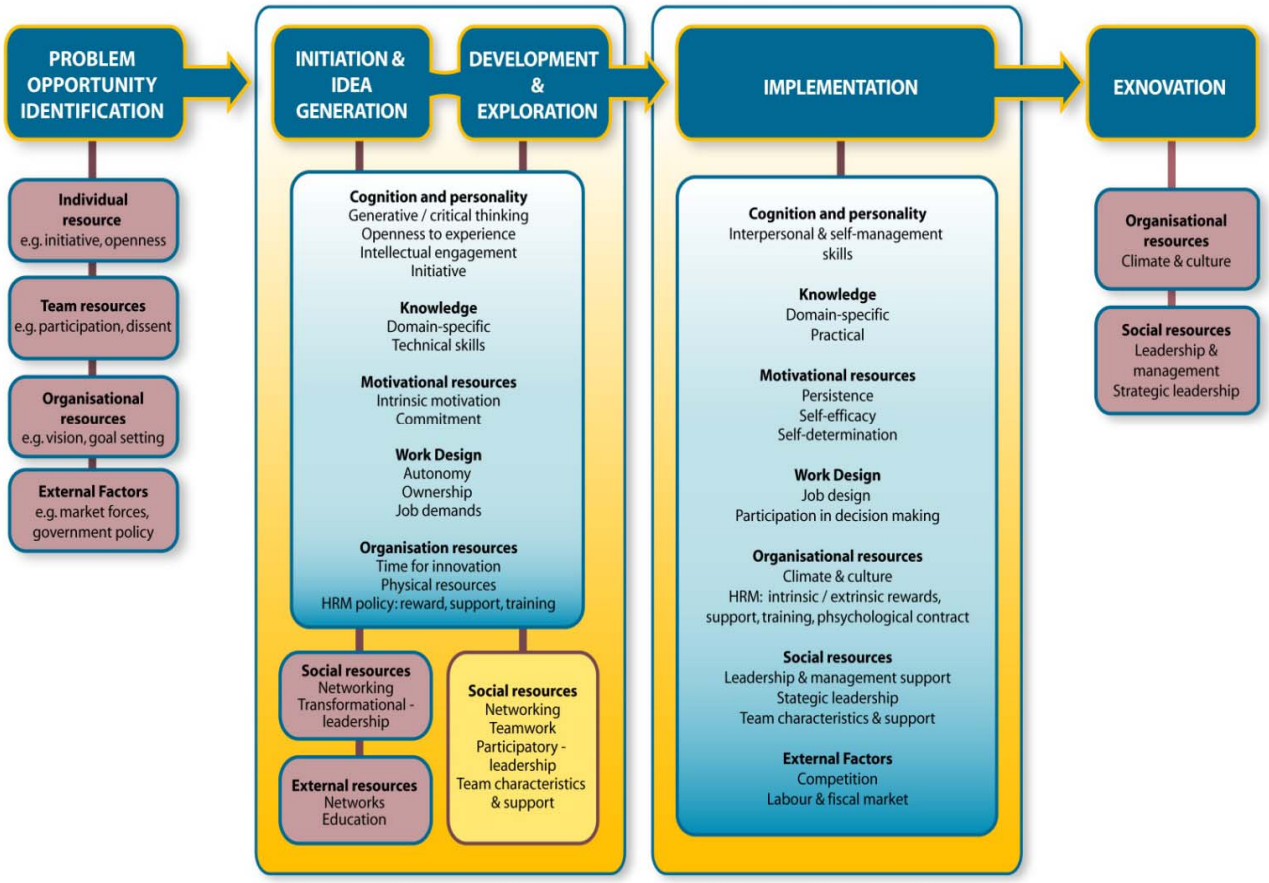



**Figure 2. Characteristics, behaviours & influencing factors mapped to the innovation process**

Axtell et al (2000) study of 'shopfloor' manufacturing workers provides support for the suggestion that individual dispositional and job factors are more tightly associated with the generation of ideas, whilst organisational and team factors are more predictive of implementation. For example, employees were more likely to make suggestions when they reported greater role-breadth self efficacy and had enriched jobs with greater personal control, but they were more likely to get their suggestions implemented when they experienced greater support for innovation from peers and management.

West and Richter (2008) propose that some aspects of organisational culture and climate differentially affect individual creativity and innovation. Job characteristics are important for both the generation and the implementation phases of the innovation process; a safe, positive and unpressured climate is conducive to creativity whilst implementation requires high work demands and extrinsic rewards. Similarly, leaders may play different roles at different phases of the innovation process such as encouraging ideas during idea generation, and providing adequate resources and selling ideas to others during idea implementation. Different team leadership styles, such a task-oriented or regulatory function (ie, direction and monitoring related behaviours) and a developmental function (ie, consideration, facilitation, inspiration) may be required at different stages of the innovation process. Paulus and his colleagues (2008) propose that the developmental behaviours may be more effective during the generation phase of the process, whilst a transformational leadership style that is intellectually inspiring may be required for effective implementation.

*Key message*
*Whilst it is possible to distinguish various broad phases in the development of innovation, the process of innovation usually progresses in a non-linear, unpredictable fashion. Various antecedents of employee innovation may differentially influence the different stages of the innovation process but more data are needed from organisational settings to validate these assumptions*

# 4. Implications for policy and interventions

Research shows that when faced with the apparently daunting task of fostering employee innovation, firms often adopt ad hoc interventions which are not supported by empirical evidence (Mumford 2002). Historically, the research literature has focused mainly on establishing the value of Human Resource Management in general, by exploring links to organisational outcomes such as turnover and productivity. Only very recently has attention turned to exploring the association between various Human Resource interventions and various innovation outcomes.

In this section, we translate current research on the innovation process and the employee resources involved, into an analysis of the practical interventions aimed at enhancing employee based innovation. Where possible, we review the empirical evidence to establish the validity of such practical interventions. It is clear that to successfully enhance and sustain innovation, effective HR interventions must consider the individual, the group, the organisation levels of intervention, and an analysis of the strategic environment confronting the organisation.

Before examining the interventions that are used in organisations, we summarise the ***inhibitors*** and ***catalysts*** to innovation identified in the literature. Uniquely, we explore the implications for human capital policies by mapping the inhibitors and catalysts to the various phases of an employee lifecycle (*attraction, talent identification, talent development, talent management and retention*). Figure 3 illustrates this approach which can be used as a diagnostic tool for organisations.

The following sections explore each aspect of the employee life cycle in detail with implications for policy interventions at the individual and organisational level.

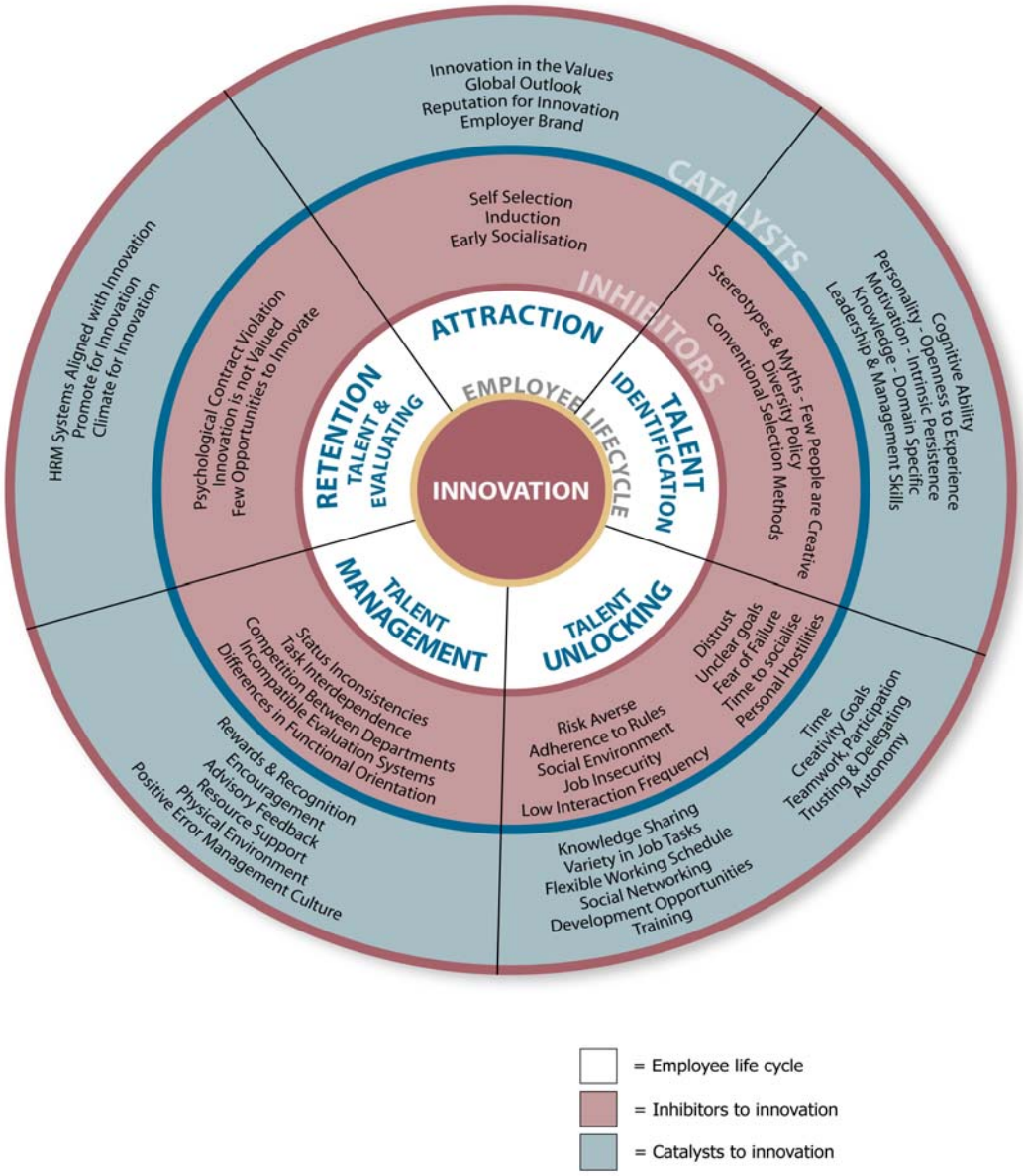
## 4.1 Employee attraction

The importance of applicants' attraction to an organisation is likely to vary from firm to firm but in order to attract innovative people, appropriate attraction strategies need to be developed and implemented. The term '*war for talent'*, which was coined in the 1990s, describes a climate where companies compete to attract and retain high calibre candidates. The concept of organisational attractiveness has recently received much attention with several articles published in the business press (Lloyd, 2002; Sherry, 2000; Ritson, 2002), in communication and marketing journals (Ambler, 2000; Bergstrom et al, 2002), and in the area of applied psychology (Collins & Stevens, 2002). The recent economic events may shift the balance if there is more competition for jobs. Nevertheless, an organisations reputation is an important feature in attracting prospective employees who will innovate.

Traditionally, research has tended to focus on the more tangible aspects of a job and/or organisation that make a firm attractive to applicants. For example, several studies have shown that applicants' perceptions of a *job* or of *organisational characteristics*, such as pay, location, opportunities for advancement, organisational structure or career programmes, are all related to organisational attractiveness (Cable & Graham, 2000; Highhouse et al, 1999; Lievens et al, 2001; Lievens & Highhouse, 2003). In addition, the literature on applicants' reactions to selection procedures has shown that applicants who hold a negative perception of the *selection process* (eg. based on recruiter's friendliness/competence) are less attracted to the organisation than those who hold a positive view (Kohn & Dipboye, 1998; Ployhart & Ryan, 1998). However, there is little evidence that this changes applicant behaviour (Sackett & Lievens, 2008). This is an area for further research.

The *person-organisation fit* literature suggests employees select organisations on the basis of their perception of '*fit'* with the organisation's values. In other words, the more they identify with an organisation, in terms of perceived similarity in *values*, *interests*, and *personality*, the more likely they are to be attracted by the organisation (Cable & Judge, 1996; Judge & Cable, 1997). ***This finding has important implications for recruiting organisations, to articulate their values in order to capitalize on attracting and recruiting candidates who will "fit" in the organisation.***

**Figure 3. Innovative people in organisations: Inhibitors & catalysts**




## 4.2 Employer reputation and brand

Cable and Turban (2001) developed a model of *employer knowledge* based on *brand knowledge.* According to this model, *employer knowledge* is made of three dimensions: employer *familiarity*, employer *image*, and employer *reputation*. Cable and Turban suggest that potential employees select organisations on the basis of these related dimensions. The first dimension, *employer familiarity*, relates to the level of awareness a candidate has of an organisation. The more familiar an organisation is, the more attractive it is perceived to be (Cable & Graham, 2000; Gatewood et al, 1993; Turban, 2001; Turban & Greening, 1997). The second dimension, *employer image*, refers to the beliefs that candidates have about objective aspects of an organisation or a job. These include organisational procedures or policies, pay, location, and benefits. The third dimension refers to the organisation's *reputation* or to the organisation's *public evaluation.* Cable and Turban (2001) incorporate the person-organisation fit approach in their model; they suggest that the

applicants' values and needs moderate the impact that employer knowledge dimensions have on organisational attractiveness.

Employer reputation has been the subject of much research in recent years. Several studies have shown that applicants assign *traits* to organisations (e.g. '*trendy'* or '*prestigious'*) which describe the organisation subjectively. Slaugther and his colleagues (2004) found that the traits potential applicants ascribe to organisations are related to the organisation's attractiveness. Moreover, the greater the sense of similarity between the applicants own personality traits and the organisation's traits, the greater the sense of attraction becomes. Lievens and Highhouse (2003) found that trait inferences about a Belgian bank (e.g. innovativeness) predict the attractiveness of the bank as an employer over and above job and organisational attributes.
The research evidence in relation to self-selection suggests that innovative people are more likely to be attracted to organisations that are externally perceived as innovative. In other words, self-selection may play a part in attracting innovative employees, such that ***reputation management is important in attracting innovative people***. If this is the case, perhaps organisations need to evaluate how they are viewed externally, consider how to build their external reputation, and to consider the way new employees are socialized into the work environment.

A related concept is the organisation's attitude towards innovation. Organisations that publicly embrace innovation should attract innovative people as well as setting innovation expectations amongst employees. Whilst most firms recognise the need to innovate, organisations vary widely in terms of their attitudes to innovation. Examples of specific organisations which have embraced innovation, including references to the impact of organisational size and sector, will be provided in the second part of this report.

## 4.3 Culture & climate surveys for innovation

The use of climate/culture surveys or work environment questionnaires may help organisations identify whether they are likely to be perceived as being innovative. Innovation audits can be used as a diagnostic tool which informs subsequent steps required to foster innovation. KEYS, for example, is an organisation survey tool that assesses the climate for creativity and innovation within work groups or organisations. The tool, developed by Amabile (1995) covers the following dimensions: (1) *Organisational encouragement* – top management support for creativity, risk taking and recognition of creative work; (2) *Supervisory encouragement* – setting clear expectations and goals, giving support to direct reports; (3) *Work group support* – mutual trust and support for colleagues, team work and skill diversity; (4) *Sufficient resources* – access to appropriate facilities, equipment, funds, and information; (5) *Challenging work* – combines the importance of with difficulty in achieving goals; and (6) *Freedom* – the sense of control over work and ideas, self-determination of how to accomplish tasks.

## 4.4 Recruitment strategies, induction & early socialisation

Innovative people tend to be intrinsically motivated and they are likely to opt for environments that provide opportunities for acquiring additional expertise and developing new ideas. Organisations should also strive to develop recruitment and induction programmes that highlight learning and development opportunities, innovation, and diversity. A related topic is the induction process that individuals go through when selection and assessment take place. The induction process should incorporate information about development and learning opportunities and it should convey the culture of the organisations. Induction can also facilitate the selection process, allowing individuals to decide whether they fit into the climate and culture of the organisation. Similarly, individuals who have innovative potential are more likely to be attracted by organisations which describe jobs in terms of broad job characteristics.

Due to globalisation of the economy and demographic changes, such as longer life expectancies and different generations working together, potential employees are increasingly diverse in terms of age, gender, ethnicity, lifestyles and cultural norms. Organisations should take advantage of these trends. It is important for organisations to attract a diversity of people, who have different backgrounds and interests since heterogeneity has been linked to enhanced innovation, especially in relation to teamwork. Hence, the importance of establishing recruitment networks and actively seeking out new talent, in a variety of institutions, in different settings, both nationally and internationally.

*Key message*
*In order to attract talented individuals who are likely to innovate, organisations must work on their reputation for innovation, they must have strong employer brands and they must work on their existing culture so that it matches the innovative employees' values.*

## 4.5 Selection & assessment for innovation

Research shows there are individual differences in the capacity of *generative thinking* and there are many assessments available aimed at creative thinking and ability tests. These assessments target aspects such as fluency, flexibility, originality, and/or elaboration. Example tests include the Torrance Tests of Creative Thinking (Torrance, 1966) and the Remote Associates Test (Mednick & Mednick, 1967). However, whilst measures of creativity thinking may be useful in predicting the number of new ideas that individuals are likely to contribute, they do not give any information in terms of the likelihood of implementing new ideas or processes. These types of tests are not recommended for selection as the evidence suggests that performance on these tests can be heavily influence by training and practice effects.

Given the importance of domain-specific *knowledge*, selecting individuals the basis of their skill and expertise is likely to contribute to innovation in the workplace. Specifically, it is important to select individuals who have the knowledge, abilities, and skills required to respond to identified gaps. Selection centres, work sample tests and structured interviews are all valid selection processes which can convey valuable information on individuals' capabilities as long as they are based on valid assessment criteria and designed and developed according to best practice. It is evident that selecting candidates on the basis of expertise alone may not be sufficient for innovation to occur; a combination of various characteristics associated with innovation, also including motivation, may prove more beneficial for innovation. Some also argue that different phases of the innovation process are likely to require different skills; while technical skills are likely to influence the generation and development phases of the innovation process, marketing and influencing abilities are important for the implementation phase (Adams et al, 2006; Calantone & Di Benedetto, 1988; Globe et al, 1973).

Similarly, in relation to *personality*, we may choose to select individuals high on openness as a predictor of innovation. For other dimensions of personality, however, the implications are less obvious, particularly in relation to conscientiousness (see Patterson, 2002; 2004). For example, the evidence demonstrates that conscientiousness is negatively associated with innovation. Conversely, many criterion-related validation studies in selection research have shown conscientiousness to be the best personality indicator of '*successful*' job performance more generally (Barrick & Mount, 1991; Barrick et al, 1993; Salgado, 1997; Schmidt & Hunter, 1998; Ones et al, 2007). Since many have argued that innovation is a highly desirable facet of employee behaviour (Kanter, 1991; Van Gundy, 1987; Quinn, 1992; Van de Ven, 1986), how do we reconcile this observation? Patterson (2002) argues that since organisational structures have changed dramatically over the past few decades, traditional employee characteristics of '*getting on and doing what you're told*' may be becoming more obsolete for organisations operating in highly competitive markets (Patterson, 2004; Jackson & Wielan, 1998). Alternatively, we could argue that organisations are not yet '*ready*' to recruit individuals who are likely to challenge the status quo, question authority and are less conforming.

Indeed, a recent survey of organisational practice in the UK, shows that firms tend to rarely use innovation as a criterion in personality assessment. When innovation is incorporated in the selection criteria, organisations often have a preference for wide ranging personality measures, such as the Occupational Personality Questionnaire (OPQ; Saville, 1973), which includes a factor called innovation. Some of the problems associated with using such measures is a focus on the quantity of ideas rather than on their quality. Other personality tools which are specifically concerned with innovation, such as Kirton's (1976) Adaption-Innovation Inventory (KAI), Jackson's (1976) Personality Inventory, and Patterson (1999) Innovation Potential Indicator (IPI) are bespoke tools aimed directly at assessing innovative potential. The KAI distinguishes two types of individuals: '*adaptors*' who are doing things better and '*innovators*' who are doing things differently. Jackson's (1976) Personality Inventory is an additional tool which purports to identify both creativity and innovation. More recently, Patterson (2000) developed the IPI (Innovation Potential Indicator), a measure of an employee's propensity to innovate which includes the all important motivational aspect of individual innovation. The IPI is also based on a more integrative approach, encompassing aspects of work

style, motivation, personality and intellect. Given that self-efficacy is a well-established predictor of people's innovative behaviour, it may be important to also include this criterion in the assessment of innovative potential. Examples of measures of self-efficacy include the Generalised Self-Efficacy Scale, a 10 item psychometric test that is designed to assess optimistic self-beliefs to cope with a variety of difficult demands in life (Wegner et. al., 1993). Tierney and Farmer (2002), recently developed an alternative measure of creative self-efficacy (with 3 items including '*I have confidence in my ability to solve problems creatively*').

One area which has not been given sufficient attention is the *selection of leaders and managers* for innovation. Findings related to employee resources for innovation show that leaders and managers play a crucial role in the innovation process. Researchers from a variety of fields (e.g. organisational behaviour and economics) argue that managers in the UK often do not have the necessary skills to manage innovation. Bloom and Van Reenen (2006) for example partly blame the low productivity of the UK, when compared with the United States and some countries in Continental Europe, on poor management skills. It has been suggested that the BBC programme '*The Office'* is a caricature of UK managers which unfortunately may not be far from reality.

The literature on assessment and selection at executive level suggests that, although a variety of selection methods are used, the final choice of candidate often remains unstructured and potentially subject to bias.
With globalisation, the importance of teams for the implementation of innovations, and the value of social networking and communication, all suggest that approaches to selecting for innovative potential, particularly at senior levels, should focus on the abilities and individual strategies necessary to acquire and share information. Assessing the personal strategies executives use to transfer knowledge may be a more useful evaluation over and above assessment of more traditional competencies. By implication, traditional psychometric tools for leadership assessment such as Bass Multifactor Leadership Questionnaire (MLQ) may not be appropriate for assessment of innovation related competencies, partly because there are concerns that the transformational leadership paradigm is one based on research carried out with male, white, middle aged CEO's. The importance of ensuring diversity (not just for innovation purposes) applies to all candidates, irrespective of the level at which they are assessed.

Of course, it is not enough to select the right people based on skills, knowledge or likely propensity to innovate. The potentially innovative people identified through the selection process must then be given adequate opportunities and further skills to fully develop their potential.

*Key message*
*A variety of methods are available for the selection of innovative people but not all are equally valid. Further work is needed to develop assessments for leadership and innovation.*

## 4.6 Development & skills for innovation

Given the importance of knowledge and knowledge transfer specifically for the generation and implementation of innovation, interventions which promote ongoing development of requisite expertise, and which reinforce the transfer of knowledge, are likely contribute to innovation. HR interventions which focus on providing coherent development plans and guidance in establishing broad career paths have a positive indirect impact on an individual's propensity to innovate. Training and Continuous Professional Development, with the use of e-learning environments for example, have been identified as key factors in the challenge of improving the absorptive capacity of UK firms (Meyer & Morlacchi, 2004).

Whilst the value of training and developmental opportunities is beyond doubt, the type, amount, and quality of relevant training is likely to affect the employees' propensity to innovate within organisations. However, empirical investigations that assess what types of training and/or developmental interventions are most efficient in enhancing innovation are scarce. Both the situated learning school and the experiential learning perspectives have emphasised a number of shortcomings associated with structured training. These include *learning transfer problems* and the fact that training may be carried out by individuals who are not aware of the daily work challenges faced by employees. Nevertheless, there is a general consensus that training is beneficial for individual innovation because it develops the skills of employees and enables them to perform their jobs effectively. *Enhanced self-efficacy* via skill training allows employees to think more creatively

(Cohen & Levinthal, 1990; Ashton & Feslstead, 2001 Shipton et al, 2006). Several researchers argue that training in a variety of skills or jobs is likely to facilitate generative thinking through increased breath of knowledge (Shipton et al, 2006; Bae & Lawler, 2000; Guthrie, 2001).

Training and development interventions are most likely to enhance innovation if mapped to the characteristics of innovative people. For example, knowledge about innovative individuals' need for autonomy may inform the way team training is designed. Innovative people tend to be intrinsically motivated and to like autonomy. Thus, allowing employees to participate in the design of training interventions and allowing them to self-select or to bid for projects that are consistent with their work and interests may contribute to innovation. Training interventions may focus on communication, employee relations, resource management, with a specific emphasis on leadership.

By using appropriate feedback, leaders are able to create the conditions and context that motivate employees to be innovative (Zhou, 1998). Zhou (2008) recently provided a framework for examining the effects of feedback on creativity. After reviewing the theoretical basis behind the value of creativity-based feedback for promoting creativity and innovation within organisations, Zhou draws a few conclusions for the use of feedback in management practice. The guidelines provided by Zhou are summarized in Table 2 below.

**Table 2: How to use feedback to promote creativity & innovation** (adapted from Zhou, 2008).

1. *Whenever possible, provide positive feedback delivered in an informative style.*
2. *If negative feedback needs to be delivered, deliver it in an informative style.*
3. *Include a large amount of developmental information in the feedback.*
4. *Focus on task-focused rather than person-focused feedback.*
5. *Consider the characteristics of the feedback recipient as they are likely to influence responses to the feedback provided. Employees with high levels of achievement motivation (ie striving to perform well against a standard of excellence) benefit from both positive and negative feedback, whilst employees with high levels of power motivation (i.e. need to exert influence on others) benefit only from positive feedback.*
6. *Employees with high levels of EI are likely to benefit more from creativity-related feedback than those with relatively lower levels of EI.*
7. *Employees are more likely to accept and respond to feedback provided by persons with more knowledge or expertise or more seniority and higher status. This in turn reinforces the importance of providing adequate and accurate feedback.*
8. *Employees must be aware of the fact that feedback coming from different sources may be inconsistent because of inaccurate feedback from some feedback providers and/or different viewpoints.*
9. *Providing feedback to promote creativity and innovation should be a long-term managerial strategy embedded in the organisational context.*

## 4.7 Social networks & knowledge sharing

The way organisations create, manage, share and store their knowledge and expertise is crucial for the various phases of the innovation process. A key attribute of innovative organisations is their ability to form *social networks* that facilitate access to a large source of information held by other individuals. Organisations have attempted to enhance the transfer and exchange of knowledge through the introduction of IT applications such as *intranets* which document organisational information, but most practitioners and academics realise that the application of technology as a solution to this problem is limited (Currie & Kerrin 2004; McDermott 1999).

Additional HR Interventions associated with the transfer of skills and knowledge and the development of internal and external networking opportunities, include amongst others, conference attendance, visits to other sites/customers/suppliers, and external courses. In addition, it is argued that *mentoring* and *coaching* activities, which involve senior members of the organisation providing developmental guidance, support, and encouragement, enhance networking opportunities and facilitate knowledge transfer. The same can be said about job rotation, an organisational intervention which is praised by many as an influential tool in promoting innovation. Advantages of *job rotation* assignments include increased job flexibility and teamwork, which in

turn are likely to contribute both to the identification and the implementation of innovations. There is an argument in the literature that job rotation should be aimed at groups that are central to the development or implementation of new ideas and that it should also contribute to the development of leadership skills. By promoting team based activities and horizontal processes, organisations enhance interpersonal communication and coordination (Gittel, 2000).

As highlighted earlier, *teams* have an important role to play in facilitating the implementation of novel of ideas and processes (Axtell, et al 2000). The literature shows that it is important to encourage diversity when assigning projects since the use of cross-functional teams made of members who display heterogeneous characteristics is associated with increased innovation.

*Training programmes*, which focus on the characteristics and management of innovations, may be useful in changing perceptions on innovation, and in providing guidance for the behaviours and strategies that might contribute to innovation. Such programmes have been shown to change organisational climate and employees behaviours towards innovation. Evidently, innovation training programmes should be offered principally to groups where innovation is of high value. Other popular interventions proposed by practitioners and mentioned in "how to" manuals on innovation include brainstorming, lateral thinking, and problem solving.

*Brainstorming* is an intervention which is used to generate novel ideas (Osborn, 1957). Although brainstorming is usually associated with group work, it can also be conducted by individuals. The main aim of a brainstorming session is to come up with new ideas or ways of improvement. Members of a brainstorming session are encouraged to generate as many ideas as possible about a problem and how it might be solved. Brainstorming is a very popular intervention in organisational settings (Furnham, 2000), but research findings on its utility are mixed. For example, in a review of research, Rickards and deCock (2003) concluded that brainstorming is not very effective as a creative problem solving technique and that individuals who work alone usually generate more and superior ideas than groups (Diehl & Stroebe, 1987; Mullen, Johnson, & Salas, 1991). This finding is often partly explained in terms of *social loafing*, i.e. the tendency for individuals to contribute less than full effort to a group. Some researchers argue that the use of brainstorming in organisational settings may still be justified given its positive impact on team building, group commitment, competition, skill variety, and organisational memory (Runco, 2004; Furnham, 2000; Sutton & Hargadon, 1996).

Several researchers and practitioners share the view that brainstorming contributes to creativity and innovation when the sessions follow specific types of instructions and guidance (Paulus et al, 2006). The major rules of a successful brainstorming session are: 1) focus on generating a large *quantity* of new ideas; 2) make *no evaluation* or judgement, and 3) attempt to *build on previously articulated ideas*. After recently reviewing the literature on brainstorming, Litchfield (2008) proposed a goal-based view of the intervention. He suggested that successful brainstorming interventions should incorporate challenging, specific goals so that expectations are tailored in advance.

Patterson, Port and Hobley (2005) provided a brief review of practical interventions to address idea generation and implementation related to innovation. Additional rules identified for successful brainstorming included: (a) adherence to the creativity methodology; (b) participants have confidence in the procedures and in the facilitator; (c) the group is heterogeneous in terms of backgrounds and experience; (d) sessions should be kept informal; (e) participants should be committed to the aims of the session; (f) the nature of the project should be interesting; (g) no assessment pressure; (h) realistic time limits. Patterson et al reviewed interventions for the generation of novel ideas including: (a) *analogy and changing the context* (encouraging people to use analogy or to change the context during a problem solving session), (b) *chunking* (a process usually used in groups whereby an issue is viewed in larger smaller chunk; it can be used as an extension of brainstorming), (c) *stretch imaging* (an exercise done either individually or in groups, where one is encouraged to consider how the world will look and feel in the future). Examples of interventions focusing on idea implementation include (a) *force field analysis* ( a process which generally involves defining how the driving and restraining forces are operating in relation to the proposed change; (b) *negative or reverse brainstorming* (focusing on the deficiencies of the existing process, practice, outcome or product, the overall aim is to list as many problems as possible); (c) *stakeholder testing* (considering the possibly divergent views of the various stakeholders; and (d) *action planning*, (creating an outline upon which more detailed planning can be developed).

*Key message*
*Training and developmental opportunities are key antecedents to individual innovation within organisations. Leaders and managers play a central role in motivating employees to innovate*

## 4.8 Talent management

A careful examination of the literature on employee resources for innovation suggests that several HR management strategies, such as performance appraisal, flexible working practices, and reward policies, may encourage innovation.

With respect to *performance appraisal* some studies suggest that the use of group or long-term based appraisal is likely to motivate employees to work innovatively. Several researchers have argued in favour of developmental appraisal and of employee participation in the whole process; some argue that developmental appraisal is a confidence-boosting activity which helps employees elucidate how they fit within the organisational context. Most researchers agree that linking pay to appraisal has a negative influence on creativity and innovation. Unfortunately, the literature is divided on whether appraisal should be process or results oriented (Schuler & Jackson 1987; Martell & Carroll 1995; Ding & Akhtar 2001; Jimenez, 2008) and there is limited evidence to support the theoretical relationship between different types of appraisal and innovation outcomes. A related topic is the management of negative influences on innovation and intrinsic motivation, such as stress, conflict, and ambiguity (Amabile, 1983; Backer, 1992; Mumford 2000).

The literature shows that innovative people are intrinsically motivated and autonomous; they are likely to thrive in organisations which allow them the *freedom* to choose how to work and when to work. They also need to have sufficient time to think creatively. Therefore, providing employees with *flexible working* schedules, *discretion in structuring work activities*, and broad core job duties is likely to appeal to them as well as enabling employees to *reallocate efforts based on opportunities arising* (Mumford, 2000).

Research insights on intrinsic motivation, rewards, and goals have implications for the design of *reward systems* that support innovation. However, the literature is still divided on how to best approach this topic. Some research shows that performance related schemes are detrimental for creativity because they undermine intrinsic motivation (Amabile, 1988; Kohn, 1993; Deci et al, 1999). Others have found that external rewards can promote creativity and innovation implementation and that a reward perceived as a bonus or as way of getting involved in better and more interesting work can foster creativity (Amabile et al, 1996). As pointed out by Mumford (2000), the reward system should therefore capitalise both on intrinsic and extrinsic rewards. This can be done through the use of knowledge or skill based pay, rewards based on progress towards objectives, and team-based incentives and rewards. However, the theoretical value of team based rewards is rarely translated into practical interventions which recognise and reward group endeavours. The literature on incentives and rewards shows that compensation is not likely to be enough to attract and retain talented innovative people. To be most effective, reward systems should be discussed with the employee regularly, throughout the employee lifecycle.

*Key message*
*Flexible working practices, discretion in structuring work activities, and broad core job duties are likely to promote employee innovation. To attract and retain innovative people, a firm's reward system should exploit both intrinsic and extrinsic rewards. To be most effective, reward systems should be reviewed with employees regularly*

## 4.9 Evaluating and retaining talent

To best retain talent, organisations must understand what is important to employees. An innovative employee's decision to stay or leave is likely to be related to opportunities for career and skill development, autonomy and participation, and support for innovation. Unfortunately, there is no easy recipe to retaining innovative people in organisations and by their very nature - innovative people tend to enjoy change!

Unfortunately, the research literature in this area is relatively fragmented. Conducting *innovation audits*, in order to find out whether the skills, practices, and structures are in place to support the different phases of the

innovation process, is an important step. *Climate surveys* that assess the work environment for creativity are extremely helpful tools for evaluating shared perceptions of innovation. In order to maximise their effectiveness, climate surveys should be targeted on groups where innovation is a crucial aspect of performance and feedback should be carefully delivered by trained personnel. The *Team Climate Inventory* (TCI; Anderson & West, 1998) and the *KEYS instrument* for assessing the work environment for creativity (Amabile et al, 1996) are two robust instruments that have been validated in several studies. The TCI is designed to examine the shared perceptions of how things happen within a particular team, especially in supporting innovation. The TCI profile indicates how the team identifies problems, generates and implements solutions and has been shown to be predictive of teams' innovative performance (Agrell & Gustafson, 1994).

De Jong and Den Hartog (2008) recently responded to Mumford's (2003) call for studies focusing on the implementation stage of the innovation process. They developed a measure of innovative work behaviour which distinguishes between four types of employee behaviours: opportunity exploration, idea generation, championing, and application. The newly developed measure, which includes 17 items based on supervisory ratings, has been shown to have convergent validity. Although the authors acknowledge that further evidence for the measure's validity is needed, they highlight that the tool is a valid attempt at measuring individual innovative behaviours in different organisational contexts.

Having reviewed the literature we present a diagnostic framework (see Figure 3) to illustrate the various interventions mapped through the employee life cycle. The content is not intended to be exhaustive. The aim is to provide a framework to identify areas for potential intervention to promote innovative working.

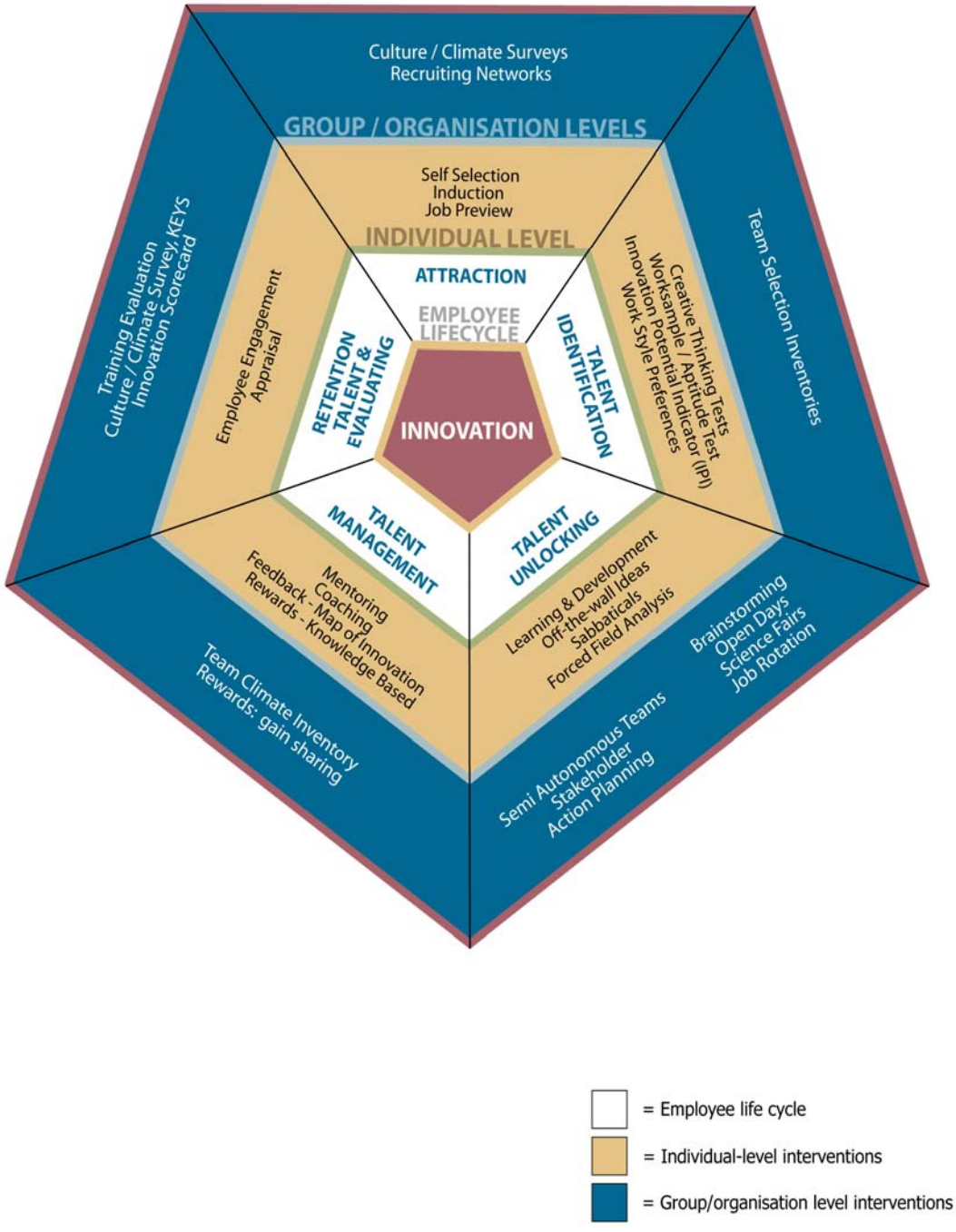
## 4.10 Summary

Having reviewed the evidence for **interventions** intended to foster employee innovation, Figure 4 illustrates this by mapping the interventions to the phases of the employee lifecycle. The analysis shows that different interventions target the individual, team or organisational levels. There are a plethora of different methods and interventions claiming to aid attraction, selection, development, management and retaining innovative people.

Anderson and Gasteiger (2007) argue that in order to successfully benefit from innovation, organisations should favour targeted innovation interventions in specific areas rather than adopting general policies aimed at maximising innovative capacity. In their overview of research in the field of creativity and innovation, they emphasize how the Dutch government policy on innovation could gain from incorporating insights concerning individual and group-level antecedents of innovation in organisations. They further argue that organisations and governments should be aware of the possible disruptive effects of innovation. The authors build on recent work on the "dark" side of innovation (Janssen et al, 2004). Anderson and his colleague argue that effective interventions aimed at encouraging innovation must consider and anticipate possible disruptions at the individual, the group, and the organisation levels of intervention.

Understanding where to focus interventions to enhance employee innovation potential is a critical issue for organisations. Research presented here shows that a bespoke approach is likely to optimise the value of interventions as 'one size does not fit all' - reflecting the complexity of the issues.

**Figure 4. Interventions for innovation mapped to the employee life cycle**



# 5. Future issues & next steps

## 5.1 Future issues

Innovation is a process with a variety of situational and individual level determinants. *Innovative individuals* have a creative cognitive style and are open to new experiences. Innovators are proactive, knowledgeable about the domain in which they are trying to implement the idea, and persistent in the face of obstacles. Future studies on innovation should investigate, as suggested by Simonton (2008), which individual differences and interests affect innovation performance directly and which are moderated by training. The role of the environment in shaping innovation is likely to have a differential impact on individuals. Future research could explore interaction effects where the individual differences in personality or experience, may influence the way a person interprets or reacts to extrinsic rewards or constraints. In general, there is a lack of theoretical integration of the variables involved at each level of analysis and relevant interaction effects. In 2004, Anderson and colleagues reviewed previous innovation research and argued for the development of multi-level theories and study designs, and triangulation of research methods to address these issues. The need to measure negative predictors of innovation is emphasised, such as job dissatisfaction, task conflict and home/work strain. Future research could also explore innovation as the independent variable.

Historically, there has been less research targeting *group level innovation*, but this has expanded recently and there are now clear practical recommendations regarding enhancement of innovation in teams. A high level of diversity amongst employees enhances team innovation if there is integration of ideas amongst employees and teams members. A positive team climate can have a significant influence on innovation and is characterised by participative safety, vision, support for innovation and task orientation. Future studies on innovation need to reflect the changing nature of work and the use of technology. The impact of dispersed and virtual teams (where members are geographically dispersed and in different global time zones) on team dynamics and innovation has not been explored. Similarly, the impact of international and cultural differences on team working and innovation has yet to be explored, where team selection may also be important. Future research could examine the impact of technology and the physical environment on innovation, by evaluating innovation laboratories to enhance idea generation and implementation at work.

The *role of leaders in enhancing innovation has been neglected*. Leaders are the gatekeepers in the innovation process and have a significant impact on the organisational climate and culture. Although organisations recognise the need for innovation, some managers may not be equipped to recruit and develop innovative employees.

Organisations wishing to create an *innovative culture* need to identify and develop people who are themselves innovative, and to ensure managers and leaders are equipped to support them by offering autonomy, resources, a shared vision, advice and feedback. Many organisations start to foster innovation through idea-capture and suggestion schemes. Although these have an excellent record of success in some companies, it is important to offer the right balance of recognition and reward to those putting forward ideas. Although most people tend to be naturally creative, in the past, workplaces have stifled creativity through command-and-control cultures, which consisted mainly of instructing and supervising employees to perform tasks. In such circumstances, there was little room to deviate from the norm. As well as recruiting potentially innovative people, developing the creative skills of the employees is crucial for developing innovation – but only if people are given the freedom to use their capabilities. Support for innovation (management support particularly) and an infrastructure that enables creativity are important (Adobe, 2008). In order to show leaders support for innovation, companies need to encourage employees to become more comfortable with both risk and change; they need to allow room for failure. In developing strategies to enhance innovation, however, we frequently overlook the influence that leaders, managers and management practices have on innovation. This observation suggests that effective HR interventions may often require a more indirect approach focusing on the development of the leadership skills needed to manage innovative people.

A range of possible *HR interventions* that may be conducive to innovation was reviewed. Although the interventions were examined in isolation, researchers and practitioners agree that a system of multiple reinforcing practices may be more beneficial for innovation (Ichniowski & Shaw, 2003; Lazear & Shaw, 2007). Whilst some interventions may be expected to have a significant effect on innovation performance when adopted in isolation, other interventions will only contribute to innovation performance when complemented by other intervention processes. A related aspect is that many of the may have multiple influences on other aspects of organisational performance. For example, increased autonomy has been related to employee engagement, which in turn is a powerful antecedent of organisational performance. Researchers have recently attempted to empirically investigate the impact of some HR interventions on organisational innovation. In a recent investigation of the relationship between HR practices and product innovation using a sample of 988 Dutch firms, Beugelsdijk (2008) showed that HR practices designed to elicit decentralisation and to promote employee empowerment, as reflected by task autonomy and flexible working hours, were associated with more product innovations. Performance-based pay and training facilitated incremental innovations but not radical innovations. The research suggests that incremental innovations may be easier to manipulate through HR interventions than radical innovations. In a longitudinal study involving 22 companies, Shipton and her colleagues (2006) found that induction, training, team working and appraisal had a positive impact on innovation. In summary, the data on the impact of HRM interventions on innovation performance is by no means comprehensive and empirical evidence for the association between interventions and innovation is scarce. This is partly due to what is referred as the criterion problem, i.e. the difficulty in measuring innovation. In this respect, real time longitudinal data collected on large representative samples of individuals or groups and assessed with a variety of methods is warranted.

## 5.2 Next steps in the research

The large body of research and empirical evidence on innovative people in organisations has provided some clear messages for the design of interventions and organisational policies. However, how these become operationalised in practice is less well understood. The next phase of the research will involve a series of exploratory semi-structured interviews with key stakeholders representing all sectors (including public, private and voluntary sectors).

The purpose is to:

(1) provide an initial validation of the framework derived from our literature review and identify priorities and desired outcomes for various sectors;
(2) review intervention methods that have enhanced innovative working in organisations;
(3) explore policy implications with stakeholders.

Our electronic survey will approach a wider sample of organisations. The survey will focus on evaluating interventions and linking innovative behaviours to performance outcomes. Up to 500 organisations in the UK will be approached. The results from the interviews and survey will be available by June 2009.

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**APPENDIX**: Key research findings on innovation resources, processes, and interventions in organizations

| 1. EMPLOYEE RESOURCES | Author(s) | Resources | Dimensions | Key findings |
|---|---|---|---|---|
| | Guilford (1967) | Intelligence | Meta-analysis/Taxonomy | • Mean correlation r between IQ and verbal Divergent Thinking (DT) = .22, symbolic DT = .40, semantic DT =.37.<br>• Proposed that creative thinking is a mental ability involving divergent production and that it is a subset of intelligence.<br>• Developed a model "Structure of the Intellect" with 3 fundamental dimensions of intelligence: (a) operations (cognition, memory, divergent production, convergent production, evaluation); (b) content (figural, symbolic, semantic, behavioural); (c) products (units, classes, relations, systems, transformations, implications). |
| | Barron & Harrington (1981) | Intelligence<br>Personality | Divergent Thinking (DT)<br>IQ<br>Tolerance for ambiguity<br>Self-confidence | • Reviewed 15 years of research on the link between creativity and intelligence.<br>• Highlighted that DT scores often failed to correlate significantly with indices of creative achievement partly because of domain specificity.<br>• Found no conclusive support for the assumption that IQ is a prerequisite for DT performance.<br>• Found a positive association between Tolerance of ambiguity, Self-confidence and creativity. |
| | Sternberg & Lubart (1999) | Intelligence<br>Knowledge<br>Personality<br>Motivation<br>Thinking styles<br>Environment | Investment theory | • Proposed an investment theory where the propensity to innovate requires 6 distinct resources: intellectual abilities, knowledge, thinking styles, personality, motivation, and environment. |
| | Gilhooly, Wynn, & Osman (2004) | Intelligence | Divergent Thinking | • Raised question about validity of DT tests as criteria for creativity.<br>• Found that individuals rely on LTM during DT tests.<br>• Proposed that LTM may also play a role in the non linear relationship between intelligence and creativity. |
| | Woldfradt & Pretz (2001) | Personality | NEO (German version) | • Reported that high scores on Openness to Experience and Extraversion were associated with scores on the Creative Personality scale for the Adjective Check List.<br>• Scientists obtained lower scores on measures of creativity and on Openness to Experience when compared to art and design or psychology students. |

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| | McCrae (1987) | Personality | NEO inventory (NEO-PI) | • Demonstrated that DT correlated with self-reported and rated measures of Openness to Experience. |
| | King, McKee, & Broyles (1996) | Personality | Big Five Inventory | • Found that self-reported creative accomplishments correlated with Openness to Experience and low Agreeableness. |
| | Gelade (1997) | Personality | NEO-PI | • In comparison to controls, advertising and design creatives scored high on Neuroticism, Extraversion, and Openness to Experience and low on Conscientiousness. |
| | Furnham (1999) | Personality | NEO-PI | • Showed that Openness to Experience predicted self-ratings of estimated Barron-Welsh Art Scale. |
| | Feist (1998) | Personality | Openness to Experience<br>Conscientiousness<br>Extraversion | • Analysed 26 studies.<br>• Found that relationship between personality measures (ie Openness to Experience, Conscientiousness, Extraversion) is domain dependent (artists vs scientists). |
| | Feist & Barron (2003) | Intelligence<br>Personality | Lifetime creative achievement | • Reported results of a 55-year longitudinal study on the prediction of creativity from early to late adulthood.<br>• Assessed measures of intellect, potential, and personality.<br>• At 27 years, measures of personality predicted an additional 20% of the variance in lifetime creative achievement over that contributed by intellect and potential. |
| | MacKinnon (1965) | Personality | CPI | • Reported that in comparison with normal architects, creative architects were more aggressive, dominant and autonomous and less socialized, deferent and team-oriented. |
| | Batey & Furnham (2006) | Personality<br>Knowledge<br>Intelligence | Review | • Reviewed research on the association between intellect, knowledge, personality and creativity.<br>• Argued that the field requires a battery of tests to assess different types of creativity (e.g verbal, spatial, numerical).<br>• Suggests that researchers should focus on the role of cultural and demographical differences and that they should differentiate between everyday achievers and eminent individuals. |
| | Patterson (1999) | Personality<br>Motivation<br>Problem solving | Tool development<br>Independence<br>Openness to experience<br>Action<br>Social | • Multi-method approach resulted in 102 behavioural descriptions associated with innovation.<br>• Discovered a four-factor model which includes Challenging Behaviour (+), Motivation to change (+), Adaptation (-), and Consistency of Work Styles (-).<br>• Led to the development of the 36-item Innovation Potential Indicator (IPI) questionnaire designed to assess innovative potential in people. |
| | Sauermann & | Motivation | Intrinsic vs Extrinsic | • Developed a model of extrinsic vs intrinsic motives on innovation. |

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| | Cohen (2008) | | | • Empirically analysed the relation between employee motives, innovative effort and performance in a large sample of R&D employees in the manufacturing and service industries.<br>• Found that preferences for challenge, independence, and to a lesser extent salary, were associated with innovative performance. |
| | Frese , Teng, & Wijnen (1999) | Motivation | Personal Initiative | • Field study which found that proactive behaviour correlated with the number of rewarded suggestions submitted by individuals in suggestion schemes. |
| | George & Zhou (2002) | Mood | Negative & Positive moods | • Using data from questionnaires and ratings in a large manufacturing company the authors hypothesized and found that when the organizational context is seen as emphasizing and rewarding creative performance, and clarity of feelings is high, people use their mood as input into the ongoing evaluation of their current efforts with regard to creative performance. Under these conditions negative moods were positively associated with creativity and positive moods were negatively related to creativity. |
| | George & Zhou (2007) | Mood | Negative & Positive moods | • Using data on employees in an oil field services company, they tested the interactive effects of positive mood, negative mood, and support on creativity (dual-tuning perspective).<br>• Reported that both positive and negative moods can promote creativity and that the joint effects only manifested themselves in a supportive context (i.e. when supervisors provided developmental feedback, displaying interactional justice, and were trustworthy). |
| | Bass, De Dreu, & Nijstad (2008) | Mood | Meta-analysis<br>Activating/De-activating state<br>Promotion/Prevention focus | • A meta-analysis summarizing 25 years of research on the mood-creativity relation.<br>• Interpreted data in terms of activating mood states (e.g. anger/happiness) that produce more creativity than deactivating mood states (e.g. relaxation/sadness), particularly when mood states are associated with a promotion rather than a prevention focus. |
| | Zhou & George (2003) | Emotional Intelligence | Leaders | • Stated that EI may be crucial when managing employee emotions and guiding employees to take advantage of them.<br>• Suggest that leaders can encourage employees' creativity through feedback and via the creation of a work climate supportive of creativity. |
| **2. WORK ENVIRONMENT** | **Author(s)** | **Type of resources** | **Dimensions** | **Key findings** |
| **2.1. Social Resources** | West & Anderson (1996) | Team structure<br><br>Team climate | Cohesiveness<br>Longevity<br>Participation | • Described the development of the TCI (Team Climate Inventory), a measure of team processes and climate for innovation. The TCI includes 4 dimensions: shared vision, group participation and |

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| | | Leadership style | Vision<br>Norms for innovation<br>Participative leadership style<br>Leader openness to idea proposals | support, team support, and group task orientation.<br>• Included two case studies where TCI is used as a team building intervention. |
| | West, Hirst, Richter, & Shipton (2004) | Work Team | Review<br>Input-process-output Model | • Developed an integrative input-process-output model designed to understanding work groups' creativity and innovation.<br>• After reviewing the literature, the authors propose 12 prescriptions for developing innovative teams, which are related to the input, process, or output of innovations.<br>• The 12 prescriptions cover aspect of team task (e.g., intrinsic motivation, autonomy, demands), composition (e.g. personality, diversity), processes (e.g. norms) and organizational context (e.g. climate). |
| | De Dreu & West (2001) | Team climate<br><br><br>Team processes<br>Leadership style | Participation<br>Vision<br>Norms for innovation<br>Minority dissent<br>Participative leadership style | • Found that minority dissent predicted team innovation (assessed by supervisors' ratings) in teams with high levels of participation. |
| | De Dreu & Nijstad (2008) | Team climate | Conflict | • Laboratory-based experiments showing that at high levels of conflict intensity individuals are innovative only in the areas related to the conflict and functional to conflict resolution. |
| | Shin & Zhou (2007) | Team member characteristics<br>Leadership style | Heterogeneity of members<br><br>Transformational leadership | • Found that teams' educational specialization heterogeneity was positively associated with innovation when transformational leadership was high. |
| | Balkundi & Harrison (2006) | Team characteristics | Team social networks | • Meta-analysis of 37 studies suggesting that teams with densely configured inter personal ties attain higher team task performance and viability. |
| | Perry-Smith (2006) | Social resources | Networking | • Tested the impact of several social network parameters on creativity.<br>• Demonstrated that unlike strong social ties, weak social ties were positively related with creativity. The relationship between weak ties and creativity was moderated by exposure to heterogeneous direct contacts.<br>• Highlighted the importance of tie strength, social environment and outside ties for creativity. |
| | Zhou (1998) | Leadership | Feedback | • In a laboratory-based study, students who received positive feedback were more creative than those who received negative |

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| | | | | feedback. Moreover, feedback delivered in an informal style (vs. in a controlling manner) was associated with greater individual creativity. |
| | Tierney (1999) | Leadership | LMX | • Determined the potential influence of supervisor-employee and team-employee relationships on employees' psychological climate for change.<br>• Found that a high LMX relationship with supervisors led to stronger perceptions of the climate as being conducive to change. |
| | Sosik (1997) | Leadership | Transformational | • Examined in a laboratory study the impact of high and low levels of transformational leadership on group creativity under anonymous and electronic brainstorming conditions, using 159 undergraduates.<br>• Found that groups working under higher levels of transformational leadership generated more idea elaborations and original solutions compared to groups working under lower levels of transformational leadership. |
| | Jung, Chow, & Wu (2003) | Leadership | Transformational | • Empirically examined by collecting survey data from Taiwanese companies in the electronics/telecommunications industry the link between transformational leadership and innovation at the organizational level.<br>• Found that transformational leadership style affected organisational innovation via empowerment and an innovation-supporting organizational climate. |
| **2.2. Work Design** | Axtell, Holman, Unsworth, Wall, & Waterson (2000) | Job characteristics | Autonomy<br>Span of control<br>Support for innovation | • Found that individual-level variables such as role breadth self-efficacy (ie confidence across a wide range of work areas) and autonomy were predictors of the number of suggestions made.<br>• Implementation of ideas was linked to a supportive environment in terms of management support, participation in decision making and team support for innovation. |
| | Oldham & Cummings (1996) | Job design<br>Social context | Job complexity<br>Supervisory style | • Empirical study found that employees with complex, challenging jobs, and who were given support from supervisors in a non controlling manner, were more likely to produce creative work (assessed with various measures). |
| | Shalley, Gilson, & Blun (2000) | Job design | Creative requirement | • In a survey of 2000 individuals, found that jobs that were higher on requirements for creativity were associated with higher levels of autonomy, complexity, demanding work and relatively low levels of control.<br>• When the requirements of the job matched the work environment, employees seemed more satisfied and had lower intentions to leave. |
| **2.3. Organisational resources** | Burns & Stalker (1961) | Organizational characteristics | Structure | • Organic vs. mechanistic structure positively related with innovation. |

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| | Eisenberg & Cameron (1996) | Organizational characteristics | Rewards | • Analysed 25 years of research on the effect of rewards on creativity and concluded that there was little evidence that reward reduced intrinsic interest.<br>• Suggested that the way rewards are administered influence creative performance. |
| **2.4. Organisational ambidexterity** | Tushman & O'Reilly (1996) | Ambidexterity | Organizational culture<br>Organizational structure<br>Leadership | • Identified the following as antecedents of structural ambidexterity in organisations: common culture and vision, decentralized structure, supportive and flexible leadership. |
| | Jansen, Van den Bosch, & Volberda (2006) | Ambidexterity | Organizational structure<br>Social relations<br>Formalisation | • Found that centralization negatively affected exploratory innovation (ie diminished the likelihood of radically new solutions)<br>• Formalization positively influences exploitative innovation (incremental improvements in processes and outputs).<br>• Dense social relations within units appear to be important antecedents of both exploratory and exploitative innovation. |
| | Jansen, George, Van den Bosch, & Volberda (2008) | Ambidexterity | Transformational leadership<br>Senior team attributes | • Studied the role of leadership behaviours in achieving organisational ambidexterity.<br>• Found that a shared set of goals and values within a senior team and contingency rewards (shared pay patterns) encouraged ambidexterity and that the presence of a transformational style of leadership reinforced this association. |
| **3. FACTORS EXTERNAL TO THE ORGANISATION** | **Author(s)** | **Type of resources** | **Dimensions** | **Key findings** |
| | Nickell & Van Reenen (2001) | Labour market<br><br>Education | Managerial skills<br>Market competition<br>Educational standards | • Discuss technological innovation, productivity, and the environment in which UK organisations operate.<br>• Argue that the UK lags behind other countries in the commercial application of technical innovations mainly because of the poor quality of general management skills, educational standards in the average ability brackets, and low levels of market competition. |
| | Blundell , Griffith, & Van Reenen (1999) | Labour market | Market share<br>Market competition | • Empirically investigated the impact of market share and competition in a sample of British manufacturing firms<br>• Found that high levels of market share and market competition encouraged innovation (headcounts of innovations and patents). |

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| | Mahroum, Huggins, Clayton, Pain, & Taylor (2008) | Inter-organizational context | Absorptive capacity | • Collected data on 26 regional indicators of absorptive innovation (the capacity to access and diffuse knowledge) in several regions in the UK.<br>• The report concluded that access to relevant national and international sources of new knowledge, ideas, and innovation should be made easier through the use of prizes, awards and support schemes. Links with firms, universities should be intensified; knowledge exchange should be encouraged with incentives and rewards and inter-regional synergies should be encouraged. |
| **4. THE INNOVATION PROCESSES** | **Authors** | **Research topic** | **Dimensions** | **Key findings** |
| | King (1992) | Models of innovation process | Stage model of innovation vs alternative model | • Carried out a seven-month longitudinal study based in a hospital which compared the accuracy and reliability of Zaltman et al (1973) stage-based model of the innovation process with Schroeder et al.'s (1986) alternative model.<br>• Schroeder et al' s model emphasizes that innovation does not progress through well defined stages but that it progresses in a non linear fashion with setbacks and surprises before being accepted.<br>• Concluded there is greater support for the general approach taken by Schroeder et al. than for the conventional stage-based approach of Zaltman et al because the innovation process is often characterized by back-tracking and stages overlap. |
| | Van de Ven (1989) | Meta-theory of innovation process | Development of several different innovations over time | • Presented the results of a major longitudinal study, the Minnesota Innovation Research Program that consisted of 30 researchers who tracked the development of 14 different innovations from concept to implementation<br>• Its findings lead to the development of a meta-theory of Innovation, which recognizes that several theories may be needed to explain the innovation process and that they apply under different conditions. |
| **5. INTERVENTIONS** | **Authors** | **Resources** | **Dimensions** | **Key findings** |
| | Lievens & Highhouse (2003) | Organizational attraction | Traits | • Found that meanings (in terms of inferred traits) that potential candidates associate with firms play an important role in applicants' attractiveness to these organizations. |

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| | | | | • Inferred traits about organizations accounted for incremental variance over job and organizational attributes in predicting a firm's perceived attractiveness as an employer.<br>• Concluded that organizations should create a symbolic meaning as an employer (e.g., focusing on an image of the organization as an innovative workplace), with the help of advertising, recruitment materials, or Web page design and content. |
| | Amabile (1995); Amabile, Conti, Coon, Lazenby, & Herron (1996) | Work environment | Climate for creativity (Assessment tool) | • Developed a questionnaire (KEYS) based on Amabile's (1988) componential theory of creativity and innovation which assesses the climate for creativity.<br>• KEYS is centred around individuals' perceptions of organizational dimensions relevant to creativity.<br>• Amabile et al (1996) found that high creativity projects could be differentiated from low creativity ones on 5 dimensions, including: organizational encouragement and supervisory encouragement, work group support, challenge, and organizational impediments (e.g. political problems, conservatism, rigid formal structures). |
| | Torrance (1966) | Cognitive ability | Creative Thinking (Assessment tool) | • Developed the Torrance Test of Creative Thinking, which measures frequency counts of generated ideas (Divergent Thinking) . |
| | Mednick & Mednick (1967) | Cognitive ability | Creative Thinking (Assessment tool) | • Developed the Remote Associates test, a measure of creative potential.<br>• The test Items consist of three stimulus words that are related to a fourth unreported word, which the participant is instructed to determine and record (e.g. remote associate of "elephant", "lapse" and "vivid" is "memory").<br>• |
| | Barrick & Mount (1991) | Personality<br>Job performance | "Big Five"<br>Job proficiency<br>Training proficiency<br>Personnel data (salary, turnover, salary, status) | • Meta-analysis investigating the relationship of the "Big Five" personality dimensions (Extraversion, Emotional Stability, Agreeableness, Conscientiousness, and Openness to Experience) to three job performance criteria (job proficiency, training proficiency, and personnel data) for different occupations (professionals, police, managers, sales, and skilled/semi-skilled).<br>• Found that Conscientiousness showed consistent relations with all job performance criteria for all occupational groups.<br>• Correlations between the other personality dimensions and job performance varied according to the occupational group and the criterion type. |
| | Kirton (1976) | Cognitive ability | Cognitive Style | • The Adaption-Innovation theory and tool derive from the hypothesis that individuals have a preferred problem solving style.<br>• Proposed that individuals vary in terms of cognitive styles (decision making and problem solving) on a bipolar continuum with |

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| | | | | adaptors and innovators located at opposite ends.<br>• Adaptors characteristically operate within known procedures and paradigms whilst innovators are more likely to take risks and to provide unique solutions by pursuing change. |
| | Bass (1999) | Leadership style | Transformational & Transactional Leadership MLQ questionnaire | • Developed the Multifactor Leadership Questionnaire based on transformational and transactional leadership, two separate concepts that are part of successful leadership.<br>• The most recent version of the questionnaire includes four dimensions of transformational leadership (charisma, inspirational motivation, intellectual stimulation and individualized attention), three dimensions of transactional leadership (contingent reward, management by exception active and management by exception passive), and *laissez-faire or nonleadership* |
| | Mumford (2000) | Organizational practice | Review on managing creative people | • Comprehensive review of the nature of creativity and implications for the management of creative individuals.<br>• Includes HR interventions aimed at the individual, the group, the organization, and the environment. |
| | Searle & Ball (2003) | Organizational practice | HR Policy and Practice | • Survey of top 300 organizations (FTSE 500) employing over 100 people in the UK<br>• Found that the importance that organizations attached to innovation was not reflected in their HR recruitment, training and performance management policies.<br>• Unlike other employees, managers were not offered much HR policy support for innovation |
| | Beugelsdijk (2008) | Organizational practice | HRM interventions & innovation | • Found that task autonomy, training, and performance-based pay predicted incremental innovation (share of products new for the firm in total sales) , whereas task autonomy and flexible working hours predicted radical innovation (share of products new for the industry in total sales) in a sample of 988 Dutch firms.<br>• The use of standby contracts was detrimental for both types of innovation assessed. |
| | Shipton, West, Dawson, Birdi, & Patterson (2006) | Organizational practice | HRM practice & innovation | • Longitudinal study which assessed the relation between HR practices and product and technological innovation in 22 UK manufacturing firms.<br>• Found that induction, team working, appraisal and exploratory learning predict innovation. |
| | Paulus, Nakui, Putman, & Brown (2006) | Idea generation | Brainstorming | • Laboratory-based study which found that giving additional rules to the usual Osborn rules in a brainstorming task, increased individual idea generation both in the traditional brainstorming and in the electronic brainstorming paradigms. The presence of an active facilitator had no impact on the number of ideas generated. |

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| | Litchfield (2008) | Idea generation | Brainstorming | • Proposed that the four rules of brainstorming can be viewed as goals.<br>• Argued that this view has implications for the design of brainstorming, where isolating goals to determine their effects and comparing different conditions should help evaluating brainstorming sessions. Setting challenging, specific goals is thought to enhance idea generation, especially when communicated in a commitment building way. |
| | Anderson & Gasteiger (2007) | Individual-level antecedents<br>Group-level antecedents | Interdisciplinary review<br>Negative innovation attributes | • Interdisciplinary review (management & organisational psychology) focusing on individual and group-level antecedents of innovation, with an emphasis on team innovation.<br>• Review did not include any specific recommendations for government policy but emphasized how the Dutch government policy on innovation could gain from incorporating insights on individual and group level antecedents of innovation.<br>• Proposed a model on negative innovation attributes.<br>• Argued for an increase in awareness of the possible negative effects of innovation and for targeted innovation interventions. |