

# 2

## Creativity and innovation

### Learning outcomes

When you have completed this chapter you should be able to:

- Understand what creativity is and how it can contribute to innovation problem solving.
- Appreciate creativity as a complex process and not just a single act.
- Recognise that managing for creativity requires paying attention to the individual, teams as well as a variety of organisational factors.
- Understand that certain types of organisational systems, structure and practices hamper creativity, whilst others enhance it.
- Appreciate that creativity can be nurtured and developed in the organisation through a process of education, training and use of tools and techniques for creativity.
- Understand how to apply a select number of creativity tools.



## Introduction

As organisational environments become more dynamic, the complexity and number of problems companies need to address rises seemingly exponentially. Competitors are getting stronger and better. Across all sectors, competitors quickly catch up with any new product release, any strategic move or new practice introduced by leading edge firms. To stay ahead companies are increasingly resorting to creativity in an effort to produce new products, improve organisational functioning and enhance decision making. Without a creative approach to the challenges facing them, there is a tendency to descend to the average of corporate practice. Many companies just mimic and implement the solutions and approaches that others improvise. This is not the basis upon which a company can become a leader in its class or the basis for it to survive dynamic change and cut-throat competition. Survival demands companies open themselves to new ideas and new ways of doing things. To do so companies must tap into the creative talents and energy of their people. Those that fail to leverage creativity regularly lose 50–60 per cent of employee power (Levesque, 2001). This figure is a lower end estimate; in quite a number of cases the loss is even greater. No company in the world can ignore this amount of potential and still hope to succeed in the modern world.

Notwithstanding all the attention and the rhetoric in corporate corridors and boardrooms all over the world, lack of innovation remains a key problem in business today. One reason for this is the continued failure to systematically manage for creativity. The first step in addressing this problem involves recognising that the creativity challenge is organisational, group and individual. It is the creativity in people and their ideas that produce innovation, but it is the organisation that must structure and encourage it for organisational benefit. In other words, attention must be paid both to the organisation (its systems, structures and culture) and the individuals within it.

Whilst the focus of creativity in the workplace is to produce organisational benefits, creativity also gives individuals significant personal benefits. Organisationally, developing creativity in employees strengthens their capacity to be more open, flexible and resilient and to see different opportunities and possibilities. These are important skills to deal with unstructured, ill-defined challenges, uncertainties and complexities of a changing world. For the individual, being creative builds self-esteem. When individuals are creative they feel good about themselves because creativity has an energising effect. People derive a great deal of personal satisfaction from being creative, which in turns leads them not just to be more productive but also to produce highly novel breakthrough ideas.



## Approaches to creativity

The old-style hierarchical company often discouraged innovation. Even when such companies managed creativity, they did so under the assumption that 'thinking' was a managerial prerogative. Managers or their designated experts did the 'creative' stuff and employees lower down the hierarchy did the 'implementation'. In other words, the mass of the employees followed orders. They carried out tasks and worked to very precise prescriptions. They had little or no power to change, adapt or improve. Thus, their 'thinking' was redundant in such organisations. Reinforcing this position was the highly compartmentalised view of running organisations. Functions operated as specialists and work was executed in relative isolation. For instance, in R&D-orientated companies technology innovation was conducted in separate, designated parts of the organisation. In these organisations, the coupling between

technology innovation and business process innovation is often overlooked. Fortunately, many companies have seen through the weaknesses of this approach. Highly innovative and creative companies have found that innovation and creativity cannot just be left to the aegis of a select few. Creativity and innovation must be fostered and harnessed throughout the whole organisation. Companies must become innovative across the entire spectrum of their activities, and this requires the involvement of all employees; from the top to the very bottom. Ritter and Brassard (1998) draw a contrast between the old approach and the new approach to creativity:

*Old approach to creativity*

- Only a few people in any organisation were considered the ‘creative ones’.
- Breakthrough ideas are needed only in the ‘strategic’ areas of the business.
- Engineers were routinely brought in to fix major production or customer problems.
- Consultants were hired to help achieve a breakthrough in products and markets.

*New approach to creativity*

- Breakthroughs are required in every corner of a competitive organisation.
- Specialists in breakthroughs are still critical, but more people must become involved in creativity to tackle the increasing number of challenges that are emerging.
- The creativity that exists naturally within everyone in the organisation must be harnessed.
- A common process for dramatic improvement must be created.



## Creativity and the creative process

Before proceeding much further, it is perhaps useful to gain a common understanding of creativity and the creative process, dispelling some myths as we go.

### What is creativity?

Creativity can be defined in various ways, depending on the standpoint from which it is being examined. It can be defined from a psychological, a social, an individual or an organisational perspective. We tackle it from an organisational viewpoint. From an organisational standpoint creativity is the ability to consistently produce *different* and *valuable* results. A vital component in the production of valuable outcomes is a disciplined process that helps to channel creativity and keep it focussed to achieve results.

Creativity is a process of developing novel and useful ideas, whether an incremental improvement or a world-changing breakthrough. At a simple level, being creative involves:

- Consistently producing a lot of ideas.
- Putting existing, or new, ideas together in different combinations.
- Breaking an idea down to take a fresh look at its parts.
- Making connections between the topic at hand and seemingly unrelated facts, events or observations.

Creative outcomes are a consequence of making original and unique mental connections. This involves ‘thinking in a divergent’ mode. Divergent thinking arrives at numerous novel or unique meanings or new and original thought by a process of synthesising and representing

images in an unusual or unconventional manner. According to Joseph V. Anderson (1992) there are three broad forms of creativity:

- **Creation** is the activity of making something out of nothing (*Creativity that makes things*).
- **Modification** is the act of altering something that already exists, so that it can (a) perform its function better; (b) perform a new function; (c) perform in a different setting; or (d) be used by someone new (*Creativity that changes things*).
- **Synthesis** is the act of relating two or more previously unrelated phenomena. Creation is nice, but synthesis is the real engine of survival and prosperity (*Creativity that combines things*).



## ILLUSTRATION

### Cooking it up

The creative urge is alive and well in the professional kitchen. Chefs are drawing energy and inspiration from an unprecedented number of sources, including technology and the sciences. The ability to mix and match diverse ingredients and techniques from around the globe continues to spark new ideas and the development of previously unimagined dishes. At the same time, advances in technology and food science provide chefs with an array of new tools and precepts, enabling them to map out a new and largely unfamiliar culinary wonderland. For instance, Heston Blumenthal, chef-owner of the three-Michelin-star restaurant The Fat Duck in Bray, England, talks about applying the theories of 'molecular gastronomy' to menu development while exploring uses for such equipment as vacuum ovens and homogenisers. When asked to identify his chief source of inspiration, he unhesitatingly points to Harold McGee. McGee, a former instructor of literature at Yale, who in his groundbreaking book *On Food and Cooking: The Science and Lore of the Kitchen* turned to chemistry to debunk some long-held beliefs about cooking.

Other chefs, approaching the subject from a different perspective, maintain that creation arises out of experience. Rosario Del Nero, Chief Executive chef for Naked Fish Restaurants in Boston, calls creativity 'the sum of your experience as a human being – your growing up, your travels, your observations. When you create, you dig into a chest of experiences, of memories, of passion, of cravings.'

(Source: Based on Frumkim, 2005)

## Myths of creativity

It is generally believed that creativity is a solitary practice. This belief remains prevalent despite the fact that most of the greatest inventions of the past century have emanated from inspired groups. Many believe that creativity cannot be managed. Yet in reality, managers can strongly shape the creative process. Most prevalent (and least productive) is the belief that groups must depend on a few, often eccentric, individuals for creative input, whereas any group can become more creative if its leaders understand and support the dynamics of creative collaboration.

Creativity often gets wrapped in mystery and talked about as if it were some genie from a magic bottle. Sebell and Yokum (2001) expose a number of common myths surrounding creativity and its organisational management. These are briefly highlighted below.

***Myth 1. You can purchase an innovation***

New products and services have always been the two most visible ways for companies to innovate, but other areas include manufacturing cost reductions, warehousing and distribution efficiencies, customer service improvements, creative marketing practices and promotions, and new forms of packaging. Many of these ‘practices’ cannot be bought on the market, because they tend to be organisation-specific. For instance, process innovation can take years to implement and master properly. Even when it is possible to buy or license a product or technological innovation the big challenge is still to make it work in the organisation. Absorbing an innovation is no easy task. The ability to absorb external innovation and knowledge is called *absorptive capacity*. New products and new services constitute only a small part of the spectrum by which companies can differentiate themselves and compete effectively. Companies must master innovation in all aspects of their operations: product, process and strategic innovation. Only those who are able to do so are likely to be the leaders in the new world.

***Myth 2. All we need are some good new ideas***

Too often, creativity is seen as the beginning and end of innovation. Such a conception impedes innovation from the very outset. Studies of innovative market leaders show that many of them are no more creative than their competitors. What they grasp, that poor innovators do not, is that coming up with good new ideas still leaves you miles away from achieving innovation. In addition to having the ideas, leading companies have mastered the second critical part of the creativity and innovation equation: the skills needed to steer fragile ideas over the barriers that block their implementation.

***Myth 3. Once we shout ‘Eureka’ we’ll be done***

The forces that drive creativity and those that drive implementation of ideas are often different. The passion for creative people is the desire for the ‘Eureka’ moment. Innovation requires both innovation creatives and innovation implementers. It is rare for individuals to possess both capacities. Innovation implementers gain fulfilment from nurturing novel, fresh ideas through to reality. These people are not driven by pride of authorship and are not intimidated by the need to motivate a cross-functional team to overcome any problems that impede the development of the innovation. Organisationally, the ideal innovation team is a blend of idea creators and implementers.

***Myth 4. The right idea will come out of nowhere***

People and teams skilled at making creative ideas a reality know not to expect the instant answers implied by the ‘Eureka’ myth (the notion that out of nowhere will come the right answer). Rather, they appreciate that if they keep working on a problem, a solution will eventually come to them. Sometimes it will be piece by piece. At other times it may, in fact, appear quite suddenly. But whether the solution appears quickly or in piecemeal fashion, it will only come because they have been doing the hard work that, miraculously, seems to get turned into unexpected insight.

***Myth 5. I’ll recognise the breakthrough idea when I first see it***

It is extremely rare that a breakthrough idea is recognised for its brilliance when first uttered. This is because most people evaluate ideas at a fixed point in time, usually when we first hear

them. It is only with the benefit of hindsight that we come to realise that an idea labelled stupid at first blush was in fact brilliant. This mistaken belief that you will instantly recognise a brilliant idea on hearing it is extremely damaging to an innovation effort because new ideas are almost always flawed in some way when they first appear.

Given the risk-averse mind-set that thrives throughout the average corporate culture, most people work in an atmosphere where volumes of seedling ideas, with brilliant potential, are ignored because their inherent value is not immediately evident. The commitment to Thomas Edison's 1 per cent inspiration and 99 per cent perspiration that is needed to make ideas a reality simply does not exist in most organisations.

***Myth 6. To be innovative, we need a clearly defined, repeatable process***

There is no single roadmap for innovation, especially the creativity part. The search for an ordered, logical set of steps and procedures that will lead anyone and everyone to innovation overlooks the inherent messiness of creativity and innovation. Innovation and creativity efforts do, however, benefit from a flexible process approach.

***Myth 7. Innovation has to be a home run***

Businesses often resist change and newness of any kind until they realise they are lagging way behind on the innovation curve. They then decide they need to hit a home run to catch up. In this state of panic, if ideas that are put forth are not gigantic, breakthrough concepts, they get rejected. Since many big new ideas tend to appear blasphemous and/or are seriously flawed, the panic can build up to hysteria, usually with lots of finger-pointing and 'blame-storming'.

***Myth 8. Innovation can be accomplished in one meeting***

This is an impossible objective that is steeped in the confusion over creativity versus innovation. Creativity might be achieved in one meeting, but innovation requires an unpredictable number of interactions that bring together groups whose composition changes, based on where you are in the flow of the innovation.

***Myth 9. We just implemented a great new idea, we can rest now***

Innovation is continuous. Today's marketplace is dynamic and constantly changing. To respond, indeed, to stay in business, you must foster a culture that understands the need for continual change. Although, many know this intuitively, too few organisations respond in an effective or timely manner. Organisations that master the art of continuous innovation are the ones that win the competitive war.

**Role of creativity in innovation: or creativity and problem solving**

Creativity can take the form of single acts of creation. However, when it is directed to innovation 'problem solving' it becomes part of a process that may consist of several phases. 'Problem solving' processes may be divided into simple, compound and complex, according to the type of problem. In companies today, we see a move away from simple problems

towards increasingly complex ones. Simple as well as compound problems can be solved by standard approaches. Complex problems, however, differ in that they are dynamic in nature. They are characterised by the rapid appearance of new patterns and the presence of interactions that are difficult to comprehend. This means that a complex problem can rarely be solved without developing new knowledge or new skills. In these circumstances, the ability of individuals to solve problems by creating new knowledge becomes a key qualification for success.

Creativity works by using *explicit knowledge* (such as expertise, rational and analytic knowledge) in conjunction with subconscious and deeper knowledge (called *tacit knowledge*) to produce creative outcomes (Leonard and Sensiper, 1998). It can be exercised in three ways. These three ways include problem solving, problem finding and prediction and anticipation, and are discussed next.

### ***Problem solving***

The most common use of creativity is indirect problem solving. Companies using creativity for problem solving tend to rely on experts with specialist knowledge in the problem area. The logic is that experts possess, in addition to their deep explicit knowledge, intuitive patterns born out of experience which they can tap into to find solutions to problems. Expertise combined with intuition helps them to more readily produce valuable outcomes than comparative novices without the skills or experience.

### ***Problem finding***

The second role of creativity is one of problem finding and framing. Creativity complements and adds to the analytical knowledge base of market intelligence. By bringing into play intuition, tacit knowledge and through questioning of basic assumptions, creativity can play an important role in the framing and finding of problems. This is often achieved by rejecting the most obvious answer in order to force an examination of alternative frames through a process of asking, which can look like totally different questions of the problem. Discoveries have often been the result of framing different questions about the same problem. Alternative framing often helps to reveal the real nature of the problem.

### ***Prediction and anticipation***

The third role of creativity is to predict or anticipate a new concept or future eventuality. New ideas, inventions and discoveries have often been observed to have been inspired from non-rational non-technical sources of inspiration. In other words, they arise only partly from the conscious and partly from the subconscious. Histories of discoveries suggest that the subconscious plays an important, albeit inexplicable, role in their enunciation. There are countless examples of breakthroughs that occurred by flashes of inspiration and hunches. Sometimes these have taken the forms of dreams, as in the case of Kekule's discovery of Benzene. Apparently, Kekule kept having a recurring dream of a snake that curled its body into a circle. This eventually inspired Kekule to conceptualise the ring structure of benzene. Most of the time these hunches and insights are supplements to expert knowledge, or what is often called 'being in a state of mind preparedness', and occur in the creative stages following extensive preparation and incubation.

Creative ideas do not emerge from thin air but are born from effort that combines the conscious, semi-conscious, and unconscious processes to modify, combine and/or extend

existing pieces of knowledge to create new useful knowledge. Moreover, creativity in innovation is not just about a single meeting to come up with that one ‘big idea’ or develop a product; it is itself a process and it requires management.



## ILLUSTRATION

### In search of problems

Many people think that innovations come about by sitting down and thinking up something new.

Rather it is the case that most innovations result from thinking about problems. Innovators and inventors see a world full of problems, and it seems the creative answers come in due time, and with the right preparation.

#### Environmental problem

Toshiba of Japan has come out with a highly innovative solution to re-using paper. The company’s e-blue disappearing ink allows paper to be returned to pristine condition and re-used repeatedly. The ink is erased by a heating process.

#### Security problem

Max Levchin, a Ukrainian, as a child of the Soviet Union was obsessed with cryptography, particularly with ways to keep information secret. In the 1990s Levchin noticed the internet problem, namely the lack of secure online transactions between individuals. His Soviet upbringing and his obsession set the ground for his solution. Mr Levchin went on to establish PayPal, the leading processor of person-to-person payments over the internet.

## The creative process

Although innovation is often seen as a simple logical process, in reality it occurs through cycles of divergent creative thinking, which throws up many potential alternatives, followed by convergence to a selected solution.

The process of creativity can be broken into five steps (Hesselbein and Johnston, 2002):

1. **Preparation:** Creativity springs from deep wells of expertise. Research shows that most creative people have a towering command of a given discipline. Often such expertise comes about after serious study and experience. To develop such depth often requires 10 years plus of experience. However, creative groups also need beginners, mid-levels, and newcomers to the field who bring a fresh perspective and ask good questions.
2. **Innovation opportunity:** To be creative, in any field, requires as a starting point a *focus of attention*. Without a ‘problem’ no direction is given to the creative effort and so it remains idle, i.e. expertise must be applied to real-world problems and opportunities. Interestingly, this throws up perhaps what is the most critical challenge: defining the problem or area of opportunity on which to focus creative energies. Ultimately, the value of the solution to a problem is only as good as the problem/opportunity that was defined in the first place. In other words, the value of creativity is constrained by the question that it sets out to tackle. The ‘right’ question (problem/opportunity) must be posed to

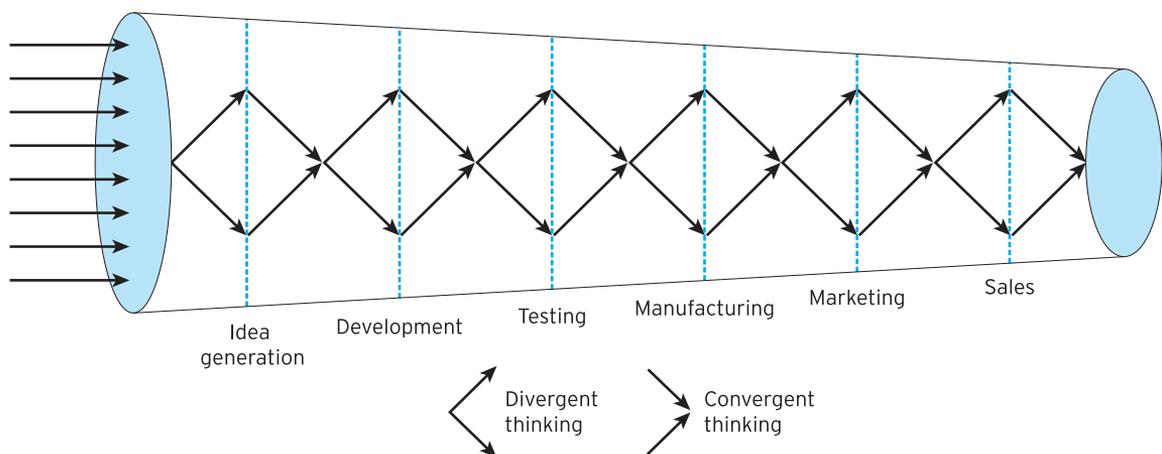
open up the possibility of getting the ‘right’ answer. This is relatively straightforward if the problem or opportunity arises from a crisis or an external market-led demand. In its absence, asking the right questions becomes much more tricky, and indeed it becomes part of creativity itself, i.e. defining the problem may require an exercise in creativity.

3. **Divergence:** This part of the process is concerned with coming up with new ideas and solutions. This is the most dynamic and social phase of the creative process. Arriving at a ‘good’ solution requires first having a wide range of alternatives. Such choice can only spring from a breadth and diversity within the group itself: a diversity of working, thinking styles, professional and personal experiences, education and culture.
4. **Incubation:** Time and space is needed to reflect on solutions or considerations that may not be immediately apparent. It is no good just accepting the first solution that comes by.
5. **Convergence:** Once a rich and diverse group of ‘ideas or solutions’ has been assembled, the next step is to select one or the few from amongst them. The process of selection involves convergence to the single or few ideas that are to be taken further. Unless this is well managed, the most vibrant and innovative ideas may be lost.

From the above we can see that creativity hinges on a repeated cycle of divergence and convergence: to first create a rich diversity of options and then to narrow down and agree upon the best ideas to implement (see Figure 2.1).

Divergence expands the number of potential solutions through enactment of the processes of creativity. Convergence screens and weeds out non-feasible options. Most typically, the sequence is one in which divergence is followed by convergence. The activity of divergence underpins the creative process. It is the part of the creative process in which the most creative ‘synthesis’ takes place. Increasingly, the big challenge in the innovation process is not really that of screening (an aspect that most companies have become very adept at through the deployment of structured methodologies and frameworks) but one of ensuring that sufficient divergence activity occurs within the straitlace of the highly disciplined, structured innovation processes that have become commonplace in modern organisations.

A common mistake is to think of creativity just as a front-end activity, confined to the idea generation stage. It rather spans the entire innovation process. Creative input is just as critical to downstream activities such as marketing and launch of a new product, manufacturing and



**FIGURE 2.1** The nature of creativity in the innovation process: divergence and convergence

quality operations as it is to conceptualising the idea in the first instance. It is just as relevant in the first stages of the product development process as it is in the final stage. Moreover, its focus must not simply be limited to product development. It must be used to examine the entire business chain and processes. As we have noted before, innovation management is more than just product innovation, it is also process and strategy innovation.

Creativity must permeate the whole organisation. It is just as relevant to the shop floor as it is to top management. Indeed, if one considers frequency of use one may conclude that it is more important for shop floor workers since they need to exercise it on a daily process. Shop floor employees need to be regularly creative if they are to improve the processes that they work with. Indeed, the concept of quality circles is predicated on employee creativity to solve and improve process problems. The impact of senior management creativity tends to be longer lasting because of the nature of their function. However, senior management in terms of frequency typically do not exercise this muscle as much. Usually they leave this exercise for their annual strategy planning or other ad hoc sessions.



## Theories of organisational creativity

Approaches to creativity theory are numerous. Broadly speaking, the various theories can be grouped into four general categories: attribute theories of creativity, conceptual skills, behavioural theories and process theories. The first two primarily place the individual as their centre of attention, while the latter two focus attention on the influence of organisational mechanisms and processes in the production of creative outcomes.

The attribute theories of creativity are based on the premise that specific characteristics and traits of individual beings predispose them toward being creative (e.g. Velthouse, 1990). Proponents of this perspective believe that creative individuals possess certain traits, such as openness, curiosity, intuitiveness, that bias them towards creative behaviour.

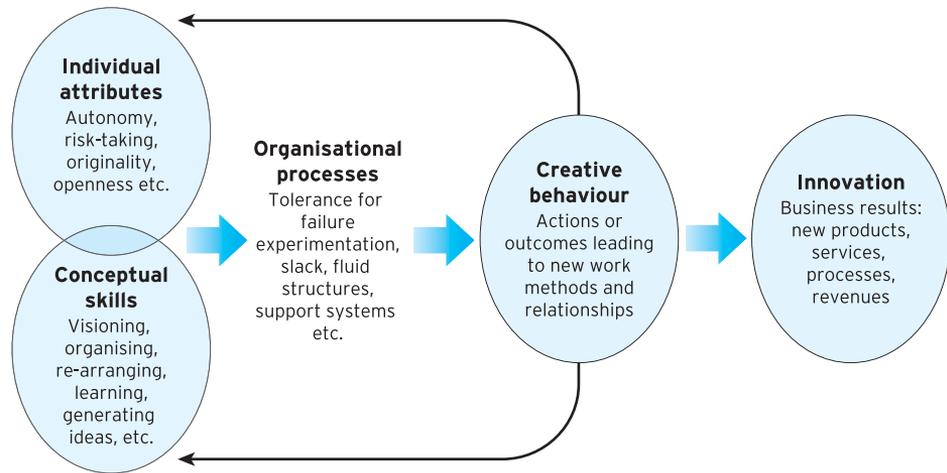
Proponents of the conceptual skills theory perspective centre their argument on the individual's cognitive abilities (e.g. Boone and Hollingsworth, 1990). The focus is on cognitive development, enhancement and use in producing creative outcomes.

The behavioural theories are predicated on the belief that creativity is an outcome of certain types of actions and activities (Amabile, 1997). The behavioural view tries to elicit certain types of behavioural outcome through the construction and deployment of mechanisms of creative behaviour reinforcements, such as rewards, setting expectations, and communications. This is probably the most familiar approach for managers.

Process theories of creativity posit creativity as a highly complex multi-level multi-faceted phenomenon, which relies on individuals' capabilities and capacities as well as organisational conditions and opportunities (Kao, 1989). Creativity occurs through the interplay of the individual, the task and the organisation.

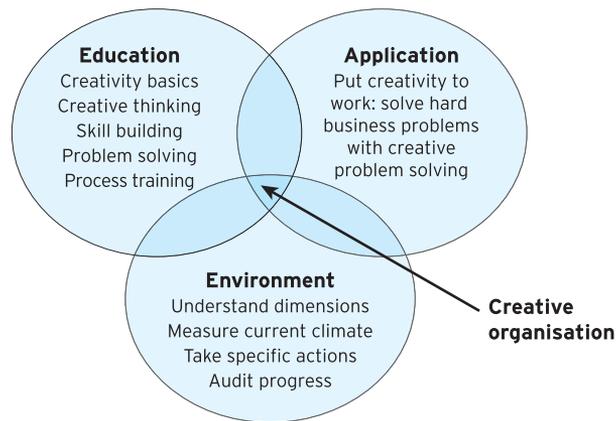
Gundry et al. (1994) combine the various approaches to develop a model for innovation through creative behaviour (see Figure 2.2).

In building a creative organisation three areas need attention, as shown in Figure 2.3 (Gundry et al., 1994). The first is education and development of creativity skills. People must be trained and educated to be creative. They must be equipped with an understanding of creativity and problem-solving tools, in addition to the basic training for their jobs. The second is application of creativity competence to solve real business problems. There is little point in equipping individuals with tools if they are not going to be used. People must be set (empowered) to solve real problems. Third, the company must diagnose itself and its



**FIGURE 2.2** Creativity for innovation

Source: Gundry et al., 1994



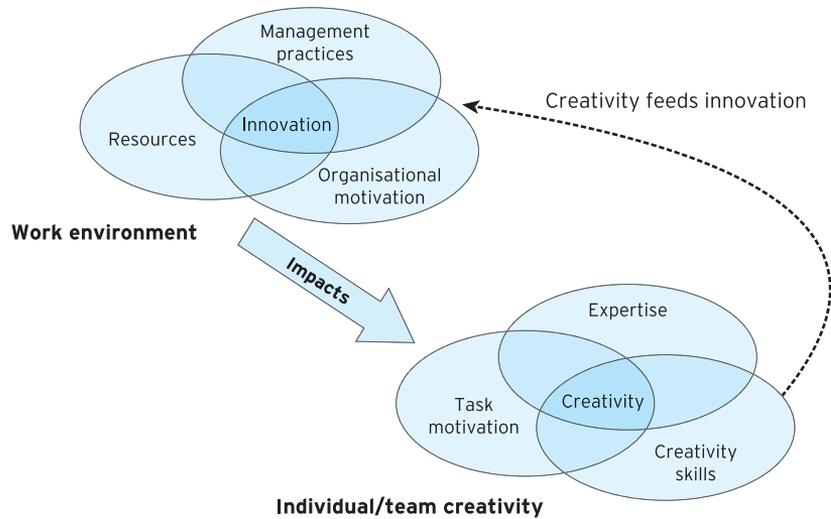
**FIGURE 2.3** The three domains for creative action

Source: Gundry et al., 1994

organisational environment to define opportunities for creative performance. This means it must collect and process information about trends in the internal and external environment.

Amabile (1997) proposes a componential theory of organisational creativity and innovation, as shown in Figure 2.4. The upper three circles capture organisational work environment components, and the bottom three circles capture components at play in individual creativity. The theory indicates that the elements of work environment affect individual creativity, and the creativity outcomes from individuals or groups act as a primary source for organisational innovation. The main assertion in this theory is that the social environment (work environment) has a major impact on individual creative behaviour. Also, whilst the environment can have an impact on all the individual level components, its main direct effects are on a person's motivation to do the job (task motivation).

From the discussion above we can discern two important dimensions to creativity: an individual dimension and organisational dimension. We now turn to discuss these.



**FIGURE 2.4** Componential theory of creativity and innovation

Source: Amabile, 1997, copyright © 1997, by The Regents of the University of California. Reprinted from the *California Management Review*, Vol. 40, No. 1. By permission of The Regents



## ILLUSTRATION

### Practice makes perfect

DuPont trains all its employees in the use of five techniques: lateral thinking, metaphoric thinking, positive thinking, association trigger, and capturing and interpreting dreams. Use of these techniques has been very profitable.

For example, DuPont researchers were trying to work out a way to dye Nomex fibres, which had proved to be impervious to dyes. Using the metaphor of a mineshaft, one researcher realised that timbers (metaphorically speaking) were needed to hold the fibre apart so that the dye could take effect. He then found a chemical agent that acted much like a timber in a mineshaft, holding the hole open until dyes could take effect.

## The individual in creativity

Without doubt the centrepiece in the puzzle of creativity is people. Organisational systems and context factors are parts of the jigsaw that serve to induce and enhance the creativity of people within it, either as individuals or as groups. So, what makes people creative? Are some people more creative than others? These are questions that have occupied the minds of researchers for quite some time. These are complex questions with a variety of contentious and complex answers. Fortunately, explanations of creativity at the people level fall into two broad categories: cognitive (intelligence and physiological) and psychological explanations.

### *Cognitive explanations of creativity*

Cognitive explanations fall into two interlinked yet distinct camps: one dealing with an individual's intelligence and the second examining the issue from a physiological perspective.

### *Human intelligence and creativity*

A large body of research suggests that general intelligence defines an individual's ability to formulate and use abstract concepts (Sen, 1991). In simple words, it defines their ability to solve problems and develop new insights and ideas. This observation finds substantial support in the many studies reporting moderate positive relations between indexes of intelligence and creative production among artists, scientists and professionals, but weak, insignificant relations in lower level occupations.

Intelligence as a concept has a close relationship with knowledge. *Intelligence* is the 'capacity to acquire and apply knowledge' and *knowledge* is the familiarity, awareness or understanding gained through experience or study (Gardner, 1991, pp. 14–15). This is why we often see intelligence defined in terms of a person's accumulated knowledge. Yet it is not enough to have a mind full of knowledge. The main thing is to be able to use it well. Simple accumulation of knowledge has little to do with creative performance. Accumulation of knowledge makes for preparedness for creative performance but it is not a simple one-to-one substitute.

Howard Gardner (1991) defines intelligence as a 'relatively autonomous human intellectual competence' and claims that there are seven distinct types of intelligence: (1) linguistic, (2) logical-mathematical, (3) spatial, (4) musical, (5) bodily-kinaesthetic, (6) interpersonal, and (7) intrapersonal. Other researchers suggest intelligence is composed of various sensory processes: perception, memory, reasoning, intention, generation of action, and attention (e.g. Covey, 1990). And these aspects can be sorted into two distinct styles of thinking (Sinatra, 1989):

1. The deliberate ordering of thoughts with full awareness – the style of intelligence reflected in *conscious thinking*.
2. The thoughts that well up into consciousness without disclosing when they came or how they were formed – the style reflected in *subconscious thinking*.

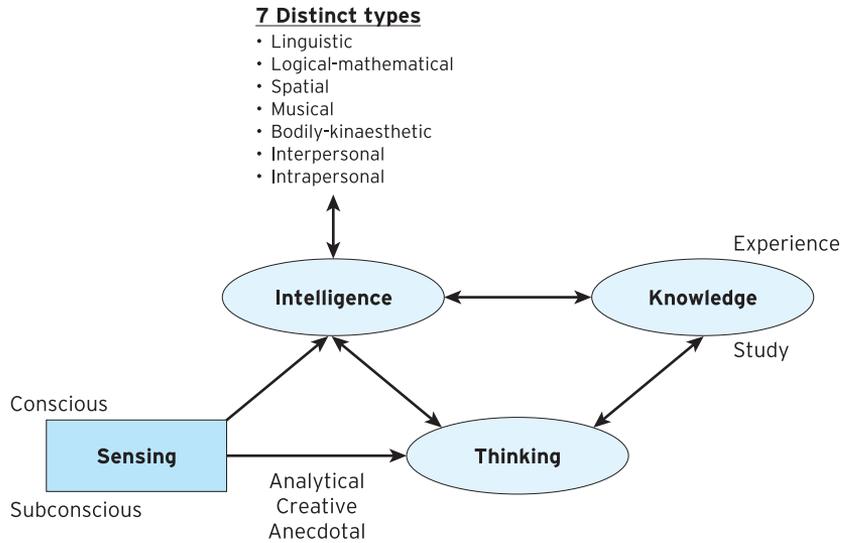
These two thinking modes (conscious and the subconscious) lead to three external manifestations/abilities:

1. *Analytical thinking* (the ability to comprehend specific knowledge).
2. *Creative thinking* (the ability to combine areas of knowledge and come up with new ideas or approaches).
3. *Contextual thinking* (the ability to make practical use of this knowledge).

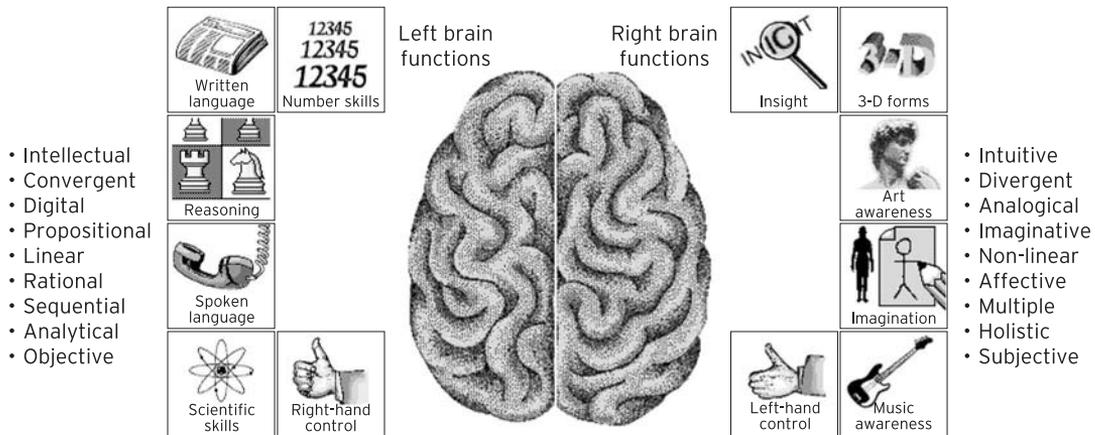
These three manifestations (or abilities) constitute intelligence in practice (Sternberg, 1987) and the most important aspect of these is not just in possessing them but also in knowing which is which and when to use it.

Even from this brief discussion we can see that individual intelligence is a complex and often highly contentious subject. It can be conceptualised in a variety of ways: a competence, a mode of thinking or an execution process. Thus, it is common to see intelligence in various ways, ranging from a competence such as verbal ability to 'street savvy-ness'. No matter how it is conceptualised, one thing is clear: all the different forms of intelligence play a role in contemporary problem solving. Thus, all the various types of intelligence need to be developed. And all can in fact be augmented by processes that build on and enhance the levels of intelligence, whether innate or developed. The interactions between human intelligence and creativity are summarised in Figure 2.5.

Perhaps, as the novelist and story-writer F. Scott Fitzgerald observed in *The Crack-Up*, 'the test of a first rate intelligence is the ability to hold two opposed ideas in the mind at the same time, and still retain the ability to function' (quoted in Rich, 1999).



**FIGURE 2.5** Interactions between human intelligence and creativity



**FIGURE 2.6** Left brain/right brain influences on creativity

Source: Adapted from MS-Encarta, Microsoft Corporation

**Physiological explanations of individual creativity**

The second explanation is closely allied to the first, but rather than focussing upon intelligence, its main attention is the functioning of the brain. The essence of this approach is around the different functioning of the cerebra of the brain (see Figure 2.6). Each of these is associated with different (information processing models) thinking modes. The left hemisphere appears to operate in a logical, analytical, computer-like fashion. The right side of the brain, in contrast, processes and makes senses of information through intuitive and non-linear complex patterns. It appears to be able to handle a vast quantity of complex and inter-linked information. It is generally contended that the left brain’s operation is inadequate for the complex synthesis readily achieved by the right. The forebrain combines the capacities of both left and right brain in the process of decision making.

The right brain's intuition and emotion is not the straight opposite of the left brain's rational and analytic capability. The right brain is neither the opposite of quantitative analysis, nor an attempt to eliminate quantitative analysis. Rather, the two are complementary cognitive strengths and powerful tandem tools in decision making. It becomes necessary to understand and rely on intuition because very few important decisions can ever be made on the basis of complete, accurate and timely information. One of the best ways to tap the power of the subconscious is to incorporate the idea of mental incubation. This is a process of giving the subconscious time to run free. In common parlance, we often refer to it as 'letting one sleep on it'. Whatever we call it, intuitive executives have found it a highly valuable way of tapping into their subconscious.

To solve problems effectively, it is necessary to use different thinking patterns at different times for different types of problems. Many highly effective business leaders practise what is called bi-modal thinking: combining macro- and micro-forms of attention (Garfield, 1986). Micro-macro-attention combines a worm's-eye and bird's-eye views. A micro-mode of thinking involves logical, analytical computation, seeing cause and effect in methodical steps. It is valued by those who prize attention to detail, precision and orderly progression. The macro-mode, the bird's-eye view, is particularly useful for shaking out themes and patterns from assortments of information. Whether you call the macro-mode intuitive or holistic or conceptual, it is good for bridging gaps. It enables us to perceive a pattern, even when some of the pieces are missing. In contrast, the logical sequences of the micro-mode cannot skip over gaps.

From our perspective, much of the research into the various cortices of the brain hemisphere or intelligence, while no doubt valuable, insightful and exciting, tells very little of how to use it to actually solve problems or become more creative in solving them. Clearly, a simple exhortation to use one side of the brain is insufficient. What is needed are specific principles and a process to develop and enhance the 'brain capabilities' as well as specific guidance on how and when to use which side during the 'problem-solving/solution-finding' process.

Let us accept for the moment that intelligence is not innate or genetic; that we can develop upon what we were born with. This means that we can develop and hone these neural capabilities via appropriate exercise or teaching. The challenge then, in one sense, becomes one of developing a whole brain pedagogy. And if this is the challenge, it is one that is poorly tackled. Most teaching emphasises the development of a rational and analytic capability. Even if teachers were capable of specifically targeting and developing the different cerebral competencies (of the left, right and frontal lobe) this by no means guarantees that people will be able to use the knowledge they acquire to solve the problems they confront. Why? Real problems are often poorly structured and hard to define, not neat academic exercises. Thus, people still need to be guided as to how to judge a problem, decide on the steps needed to solve it and follow it along to make sure these stems lead to a solution. Firstly, they need to be shown how best to apply their knowledge and experience to the solution (Sternberg, 1987) and secondly they need to be given the opportunity to do so.

### ***Psychological explanations of individual creativity***

This explanation moves the focus upon the individual and his or her predisposition towards certain behavioural patterns and forms of understanding. In other words, rather than one's intelligence or one's neurology, the state and predispositions of the individual become central to the explanation. These theories, because of their focus of attention, are often called personality or attribute theories of creativity.



## ILLUSTRATION

### Tapping into your different minds

The renowned creativity expert and thinker Edward de Bono has developed a system for tapping into the different aspects of one's brain. This system he calls the six-hat system. The six-hat system is sometimes confused with a creativity technique, which strictly speaking it is not. It is a system that deliberately taps into the different thinking and reasoning patterns of the mind, and does so in a way that makes time and space for creativity.

#### The six-hat thinking system

The six hats are metaphorical hats, which a thinker can put on or take off. Each of these hats indicates the type of thinking that is being used. This putting on and taking off is an essential part of the system. de Bono strongly cautions against the hats being used to categorise individuals, even if someone's behaviour invites this.



**White hat:** This hat is about facts, figures and information, asking questions, defining information needs and gaps. When someone calls out 'I think we need some white hat thinking at this point . . .', this indicates that it is time to move on to examine the facts and figures, market intelligence to check out the current thinking.



**Red hat:** This hat covers intuition, feelings and emotions. The red hat allows the introduction of feelings and intuition into the debate. It invites comments such as 'Putting on my red hat, I think that is a terrible proposal'. The red hat provides full permission to a thinker to put forward his or her feelings in the subject at that moment without fear that these will be laughed out of court by the heavy voice of 'facts or rationality'.



**Black hat:** This is the hat of judgement and caution. It is the hat of logic. It is used to assess why a suggestion does not fit the facts or the problem at hand. It is the hat that is most frequently employed but in no sense is it an inferior hat. The black hat is called the logical negative.



**Yellow hat:** The yellow hat is the logical positive. It asks why something will work and what the benefits are. It is used to forecast the likely outcomes of implementing a proposed solution.



**Green hat:** This hat is for creativity. It is used for finding new options and alternatives. It is about bringing forth new and novel insights from a process of provocation, challenge and change. de Bono has devised the term 'PO' (Provocation Operation) to deliberately introduce challenge of current assumptions or just simply a challenge. PO introduces 'movement' to a new position. The challenge may be introduced by several formal ways, the key of these include: Escape, Reversal, Exaggeration, Distortion and Wishful Thinking. In using these step-by-step methods, the lateral thinker is able to deliberately provoke his or her own thinking.



**Blue hat:** This is the overview or process control hat. This hat does not examine the subject/problem under scrutiny but the way it is being tackled. For example, one may say with this hat 'Putting on my blue hat, I feel we should do some more green hat thinking at this point'. In technical jargon, this hat is concerned with meta-cognition.

The system sets up a process in which a number of thinking patterns can be allowed to come into play. An individual can express his or her thoughts under the protection of one or another of the hats, or one person can ask another to put on or take off a particular colour of hat. For instance, if one person is being overly negative about an idea another person might say: 'Well that is brilliant black hat thinking, but now let us try some yellow hat thinking on that'. In this way a switch can be made immediately and without offence.

(Source: Based on de Bono, 1970)

Unsurprisingly, there is a huge amount of varied and complex research in the field of psychology dealing with human behaviour. From amongst these, one of the most insightful from our perspective is the work of Swiss psychologist Carl G. Jung (1875–1961). In 1923 Jung, whilst noting individual differences, found stable patterns in behaviour across individuals. He traced these patterns to preferences for recognising, paying attention to, and remembering people, ideas, and things and then making decisions or judgements about them. Jung defined eight different patterns for perceiving information and making decisions. He believed each of the eight patterns of difference to be equally valuable and equally creative. According to Jung, the creative instinct exists in everyone. You just need to identify, understand and refine your pattern preferences, or creative talents, to be more effective, productive and creative.

Jung proposed a wholly different perspective on thinking, based on his theory of personality types. He suggested that four psychological functions (*sensing, intuition, thinking and feeling*) comprise the basic attitudes that affect conscious behaviour. According to Jung (1971), people develop dominant preferences for certain types of data in their thinking: preference for either sensation or intuition.

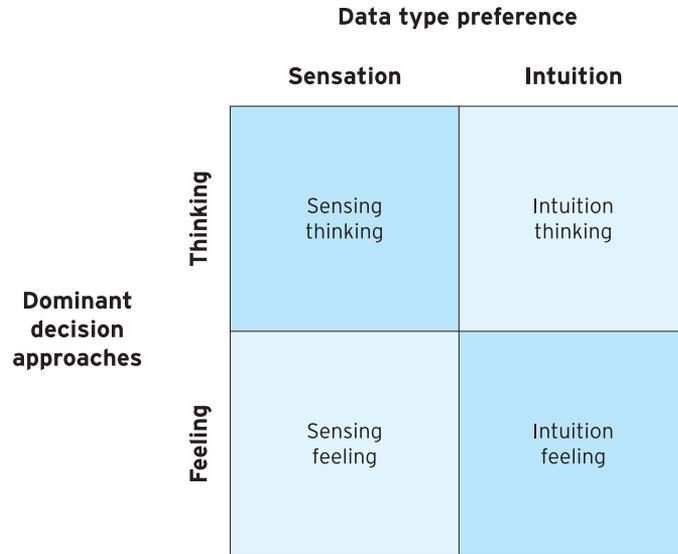
1. *Sensation-dominant* people prefer precise, specific data. They see themselves as realists concerned with immediate problems.
2. *Intuition-dominant* people seek holistic information that describes possibilities, and their decisions use more general data.

Jung also found two dominant ways that people reach decisions: by thinking or by feeling.

1. *Thinking-dominant* people emphasise logic and formal modes of reasoning. They generalise and make abstractions.
2. *Feeling-dominant* people form personal value judgements. They explain things in human terms and emphasise affective and personal processes in making decisions.

On the basis of the two ways that people obtain data and the two ways they evaluate data, Jung defined four personality types: (1) sensing-thinking; (2) intuition-thinking; (3) sensing-feeling, and (4) intuition-feeling (see Figure 2.7).

1. *Sensing-thinking* types stress systematic decision making and hard data. They try to establish order, control and certainty. They focus on tasks and structured information. They take fewer risks than other types.
2. *Intuition-thinking* types tend to ignore specific, detailed information. They prefer to study patterns in data. Their thought takes bolder leaps into the unknown. They emphasise longer-range plans and new possibilities.



**FIGURE 2.7** Jung's four personality types

Source: Jung, 1971

3. *Sensing-feeling* types stress harmony, personal communication, and other people's opinions. Facts about people are more important than facts about things. They focus on short-term problems, with human implications.
4. *Intuition-feeling* types rely on their own judgement and experience, often portraying personal views as facts. They prefer holistic, intuitive perceptions to rules in decision making. They focus on broad themes and long-term goals.

Accordingly, each person displays a preferred method of understanding reality and people have different operating styles. In making decisions, people vary in how much data they want, whether they rely on intuition, gut feeling or logic, whether they play the 'doubting' game or the 'believing' game, and the way they arrive at a conclusion. In perceiving and judging, many people exhibit all four personality types at different times. Most people, however, have a dominant, preferred style. This is the style that they use more often than the others, across a variety of situations, particularly in situations that are fluid and not firmly structured.

From this, we see that one method of discovering people's creative potential and approach is to determine how they recognise information and define problems and challenges, as well as the way they go about producing creative responses and solutions (Levesque, 2001). To make Jung's model more accessible and help define these preferences, Katharine Briggs and Isabel Myers developed the Myers–Briggs Type Indicator personality indicator. Other instruments can also be used to address personal creativity styles, such as Kirton Adaption Inventory (KAI) and the Hermann Brain Dominance Instrument (HBDI).

## Organisational factors in creativity

To get creative performance we must understand how organisational practices, processes and policies either enhance or inhibit creativity. A number of organisational factors



## ILLUSTRATION

### Motorola right brains it

Not only is Motorola one of the world's largest manufacturers of semi-conductors, it has many firsts to its credit. These include the car radio (the origin of the name 'Motorola'), the 'walkie-talkie', the 32-bit microprocessor, full-text two-way pagers, and a single-chip global positioning system (GPS) receiver solution.

Every year, the Motorola Labs team gathers together for a workshop to practise creativity and stimulate innovation in areas such as consumer systems, communications, advanced technology, networks, software and internet research, physical sciences and solid-state research. These activities from across the company were in fact combined in 1998 to form Motorola Labs, a single research organisation with a global team of scientists, engineers and technicians. Their focus is on discovering and developing new materials, technologies, architectures, algorithms and processes for smarter devices and systems.

The workshops aim to promote 'whole-brain thinking', combining right-brain creativity based on aesthetics and holistic feelings with left-brain linearity, logic, analysis and accuracy. The result helps better equip Motorola researchers to transform the promise of technology into something tangible that can be applied to solve real problems for customers and open new opportunities for the company's business.

Typically, the business-case workshops start with group brainstorming to generate creative ideas. The idea selection process follows, whereby individuals synthesise their ideas in order to aggregate similar business cases that may one day result in new and innovative products.

While the atmosphere of working through implementations as a team was always stimulating for the researchers, the teams and the implementers started to feel that the sessions seemed to lack real inspiration. They didn't always explore all the possible applications, and ideas were not always focused or organised. In the past, a variety of table toys such as Playdough and Tinker Toys were used to stimulate workshop brainstorming sessions. In 2004, in an effort to drive creative thinking to a more productive level, Motorola tried DesignAid.

Art Paton, Motorola's senior programme manager for advanced technical education, purchased the five issues of DesignAid published by Inventables. DesignAid stimulates right-brain thinking by allowing users to touch and feel. The hope was that the items in the DesignAid kits would assist the researchers. Paton's goal was to expose researchers to a variety of provocative materials and technologies from a broad range of industries to stimulate creative thinking and provide taking-off points. The various materials were used to spark creative ideas.

According to Paton the results were 'incredible'. Paton, who has run the Motorola Labs business-case workshop for the past three years, said the contents of DesignAid introduced the Motorola Labs team to innovations they would not otherwise have been familiar with, and helped them apply creative concepts in a variety of application spaces. Motivated by the hands-on engagement with the DesignAid samples, the research teams brainstormed and the exercise resulted in five new business proposals.

(Source: Based on Anon, 2004)

influence creative behaviours. These are briefly elaborated next. But before going on to these, it is important to note that just as there is individual intelligence, there is also organisational intelligence.

Our discussion in the previous section focused on human intelligence. A number of researchers have also conceptualised intelligence at a collective level (Williams and Sternberg, 1988; Walsh and Ungson, 1991; Glynn, 1996). Glynn (1996) highlights the key features that define the concept of organisational intelligence as:

- Organisations functionally resemble information-processing systems that process information from the environment (i.e. organisations have intelligence that is similar in function to that of individuals).
- Modelling organisations as information processing systems suggests that they are also able to act as interpretive systems, i.e. they are able to scan, interpret and diagnose their environments.
- The organisation is a network of shared meanings that are sustained and used through development and use of a common language and social interactions.

Although organisational intelligence is noted to bear resemblance to individual intelligence, it nevertheless is not the same. It is a social outcome resulting from the activities of the collective. It is based on accumulated wisdom of the individuals that form the collective, as well as the nature of their individual interactions amongst each other. Organisational intelligence is also a function of time and context. Over time and through different histories organisational intelligence may accumulate, ebb and even be lost through leakage. In other words, when we think of organisational systems, structures and culture we must remember that it is *not* just the individual that they influence and manage. They simultaneously influence and manage the collective: the group or the team(s), and they manage and influence the systems, values and processes (which in themselves are constituent parts of organisational intelligence) over time and over different environments and settings.

From the many organisational factors that influence creativity and innovation four have major consequences. These are: leadership behaviour, organisational structures, organisational culture and measurement systems. These are dealt with in later chapters, so we only briefly elaborate upon them here.

### ***Creativity and leadership behaviour***

Leaders can cultivate creativity by facilitating the five conditions of the creative process: (1) preparation (collecting both expertise and new perspectives); (2) innovative opportunity; (3) divergence (a range of options though professional and personal diversity); (4) incubation (time out for reflection); and (5) convergence (selection of options). Leaders establish the psychological and physical environments that support creativity. By virtue of their position they are best placed to identify long-term opportunities and define the direction in which to focus creative efforts. Leaders influence the creative process in the following ways: (Hesselbein and Johnston, 2002):

1. Forming heterogeneous groups (teams) comprising of a mix of individuals, some with specific types of expertise and others who are novices or outsiders.
2. Being sensitive and aware enough to recognise opportunities for innovation as they first arise.
3. Balancing the need to set an agenda, press ahead and push people towards an agreed upon outcome, with the need to have sufficient divergence of thought and alternative solutions.
4. Ensuring enough time is allocated to teams to support incubation.
5. Guiding idea selection by acting as a referee, coach, lobbyist, diplomat and conductor.

Leaders guide the change process by ensuring the presence of visioning, experimenting, pattern breaking, and bonding, and by keeping these four elements in balance. The individual who takes full charge of a large-scale change is necessarily strong, determined, and

masterful at mobilising people around a vision. Successful leaders in uncertain environments need to maintain an on-going vision and commitment that gives an inherent strength in their organisations.

### ***Creativity and organisational structure***

Although command and control hierarchical structures can foster a sense of accountability and logic to the decision-making process, they are often too rigid. A key organisational form used for creative action is through the development and deployment of artificial structures or temporary structures such as teams or skunkworks. Teams such as specialist skunkworks have many characteristics – they are lean, agile and filled with cross-functional knowledge. Companies traditionally set up special teams for very important projects that require significant new ideas, new technologies and new processes. These teams are often successful because common corporate barriers have been specifically removed to facilitate quick and effective results.

Teams that manage to produce extraordinary results tend to be those in which team members worked well together in a climate of mutual trust and respect, effective communication, and commitment to growth and learning. These teams are usually made of individuals with complementary skills and talents.

Processes designed to facilitate constructive conflict resolution and successfully implement solutions can heighten the effectiveness, productivity and creativity of teams. When



#### **ILLUSTRATION**

### **Cola-innovation, it's the real thing**

Several events conspired to drive down growth at Coca-Cola from 1998 to 2002 from 4 per cent to less than 1 per cent per annum: key of these was a shifting marketplace and management distractions. But in the process Coke has seen the need to establish innovation as a key strategic priority. To drive innovation Coca-Cola has developed three platforms.

***Innovation centres:*** Three innovation centres located in the US, Europe and Japan are staffed with creative thinkers. These individuals report to marketers with new brand ideas, route to market approaches and new packaging ideas. They will oversee ideas from concept to commercialisation.

***Marketing workbenches:*** This includes thinkers inside and outside the company responsible for developing creative ideas for driving the business. Participants in these look to develop innovative approaches around customer partnering, packaging, new product development, digital marketing beyond the internet and experiential marketing ideas.

***Idea works:*** A database of abstract creative ideas that can be accessed around the world by Coke personnel. This includes consumer concepts, community events, promotions, new designs and new communications.

Coca-Cola uses as its yardstick three criteria:

1. *New consumers* from new beverage solutions and flavour extensions.
2. *Growth of categories* by transferring ideas from its operations around globe (quick wins).
3. *Creation of new profit streams* through radical innovations.

processes are designed with flexibility, customer service, optimal time to market and product excellence as the goals, they do not add bureaucracy but instead provide procedural guidance to save time in the long run (Kessler and Chakrabarti, 1996). Such processes are designed to ensure that the team balances planning with execution, and idea generation with delivery (Roberts, 2000). In fact, most of what happens in successful innovations is not the happy occurrence of a blind flash of insight, but rather the careful implementation of an unspectacular but systematic management discipline (Drucker, 1985).

### ***Creativity and organisational culture***

Innovation depends critically on people. People are creative and innovative when they are expected to be innovative, when they are given the resources to be innovative, and when they are rewarded for their innovations. Many company cultures have a negative impact on innovation. A rigid organisation that puts too much emphasis on ‘the way things are done here’ inhibits employee attempts to try new ways.

Continuing to use conventional thinking and even increasing the intensity of its application (i.e. get more facts, obtain more accurate measurements, do more studies, be more objective) as the means of improving the quality and quantity of solutions is perhaps the biggest inhibition to effective thinking. People struggling to do a job well will focus on what works for them. They adopt practices, refine them, gain confidence in them and make them their own. This embeds a ‘Not Invented Here’ syndrome. Overcoming this cannot be taken lightly. The solution is to promote a culture in which using ideas from any source is made part of the company’s problem-solving discipline. The aim is for people to ‘own’ the ideas even if they were first generated by outside sources.

Innovation is about change. Most people react negatively to change, especially to that for which they are ill prepared. Also, the more comfortable they become with their work, the more unwilling they are to accept change. Sternberg (1987) notes the importance of helping people to become aware of and remove the emotional and motivational blocks that prevent them from applying their intelligence to everyday living: lack of motivation, lack of perseverance and fear of failure. Indeed, a great inhibition to effective thinking and full-spectrum creativity is simply the fear that arises naturally when one is called upon to do anything for the first time.

Companies can help nurture creativity by adopting innovation processes that provides the ‘mental space’ for new ideas to take root. For this to occur requires an open culture: one that shares extensively its knowledge and resources with the whole enterprise. As companies grow in size they find structure is required for the innovation and creativity process. Certainly, structure becomes a necessity as they grow beyond the size of an ‘everybody knows everybody’ team. However, these companies must guard against structures and systems that deaden new ways of thinking and doing. They need to implement structured processes that ensure that there is appropriate time, space and resource to seed, grow and develop ideas to fruition.

### ***Creativity and measurement systems***

Organisationally, companies need to measure their progress. Measurement is an important part of the continuous improvement cycle. However, they must take great care how they measure since measurement has both positive and negative aspects to it. Narrow measurement systems and metrics can easily suffocate creative behaviour. People respond to the metrics by which they are measured. For metrics to serve the intended purpose, they must be easily understandable, clearly defined to the people to whom they apply, understood by

them and accepted as appropriate means to measure a given function. They must be such that they provide scope for creativity to take place, and rather than depress innovation, they should act as drivers of change and betterment. To achieve this aim it is often necessary to marry measurement with rewards.

Creative behaviour can be defined and also measured in many different ways but nonetheless in nearly all studies of creativity measures are drawn from only one of three basic categories (Garfield, 1986):

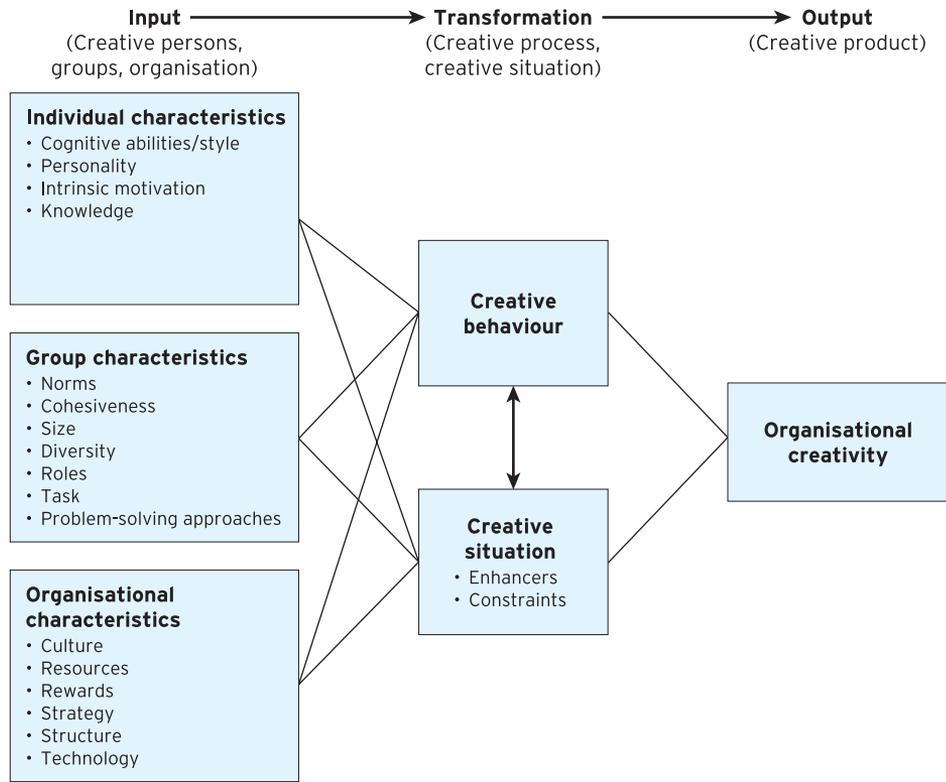
1. *Overt production criteria*, such as publication counts or patent awards. These measures assess creativity in terms of the frequency with which individuals generate innovative products having acknowledged social worth or the quality of these products.
2. *Professional recognition criteria* assess creativity in terms of the awards given to individuals for the production of new ideas or products held to be of some value in an occupational field.
3. *Social recognition criteria*: The judgements of knowledgeable others, such as peers or supervisors, afford a basis for assessing the value of an individual's novel contribution in some area. Although these criteria differ in many ways, they seem bound together by their common concern with the production of novel, socially valued products

It is important to ensure that a correct mix of the three is used. Over-reliance on production metrics tends to dampen innovation effort. The fuel for creative impulse must be provided through complementary emphasis on social and professional recognition.

### Integrated multi-level models of creativity

Thus far, we have discussed a number of organisational models of creativity. From these we drew out the importance of two key elements, the individual and organisational dimensions, as key factors in determining and influencing creativity. We draw this section to a close by examining a number of multi-level models of creativity that attempt to integrate the factors that have been proposed. Three models are notable from amongst the many. Woodman et al. (1993) present an *interactionist view*, in which important influences on creativity at different levels are identified. Ford (1996) builds on Woodman et al. (1993) by proposing a co-evolutionary process model which describes how individual interpretations of multiple task domains within and between different levels impacts on their preference for routine or novel actions. Ford also examines how the introduction of novel actions influences the evolution of task domains. Drazin et al. (1999) extend the multi-level models by showing how a crisis shifts individuals' and communities' attention between two specific task domains (technical versus managerial) during a long-term creative project. They also show how the crisis re-frames the negotiated order of belief structures about creativity.

Here we elaborate on Woodman et al.'s interactionist model since it is the foundation upon which many other multi-level models have been built (see Figure 2.8). Woodman et al.'s (1993) model is based on the premise that behaviour is a complex interaction of a person and situation, and this is repeated at each level of social organisation. In other words, group creativity is a function of individual components as an input (i.e. group composition), as well as group-level factors such as group characteristics (i.e. norms, size, degree of cohesiveness, diversity, etc.), group processes (e.g. problem-solving approaches) and contextual influences (arising from the organisation at large and the nature of the task given). Likewise, organisational creativity, in turn, is a function of the creative outputs from the groups and contextual influences (e.g. organisational culture, resource constraints, etc.). The overall outcome in terms of new products, services, improved processes and new structures is a



**FIGURE 2.8** Integrated multi-level model of creativity  
Source: Woodman et al., 1993

consequence of a complex interaction between the individual, group and organisational characteristics, which influence and define the salient creative context at each level of the organisation.

Woodman et al. (1993) show that the antecedents of individual creativity are defined by cognitive ability, personality factors, cognitive factors, intrinsic motivation and knowledge. These factors influence and are influenced by social and contextual factors. Group-level creativity is not a simple summation of individual creativities but is, in addition, determined by group composition (e.g. diversity), group characteristics (cohesiveness, group size, etc.) and group processes (problem-solving approaches, social network information, etc.), and contextual influences originating from the organisation. At the organisational level creativity is determined by contextual factors that define the organisations, such as organisational culture, reward systems, and training in creativity, external environment influences and group-level creativity.



## Creativity techniques

Although creative activity is recognised as being important, the potential of creativity is rarely fully exploited or managed. The best way to enhance creativity is by getting people to practise it. If we sit back and content ourselves with identifying creativity, rather than

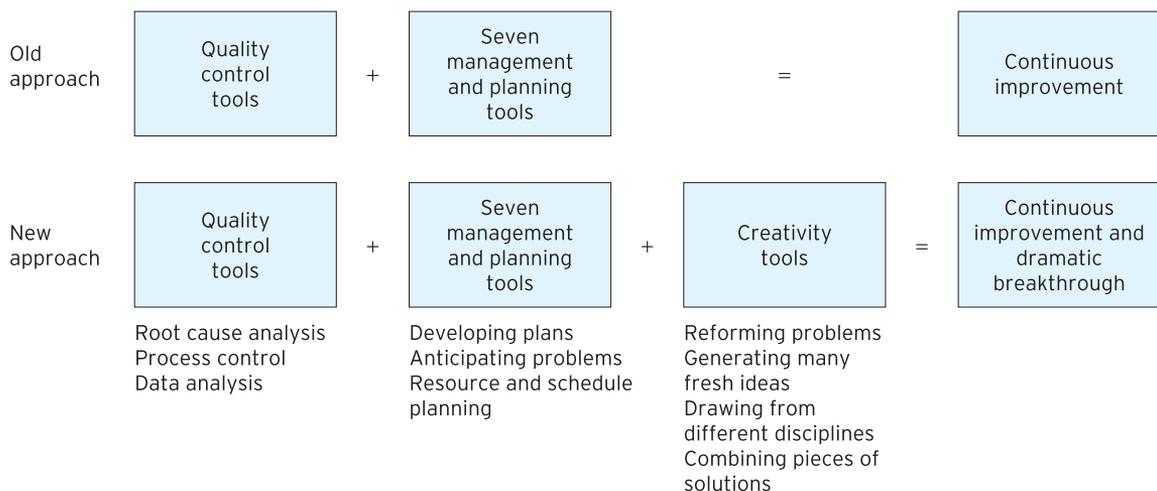
practising it, that makes us useless: all talk and no action (Sternberg, 1987). For creative outcomes to be produced, individuals must be trained in the tools and techniques of problem solving and creativity.

Innovative organisations have come to realise that every person needs to contribute their experience and creativity. However, some people have more fully developed their ability to piece together new ideas and to communicate them clearly. Creativity tools provide a structured way for an individual, group or team to combine intuition, imagination and personal experience to create interesting and eventually innovative concepts and solutions. These innovative solutions can be aimed at virtually any target:

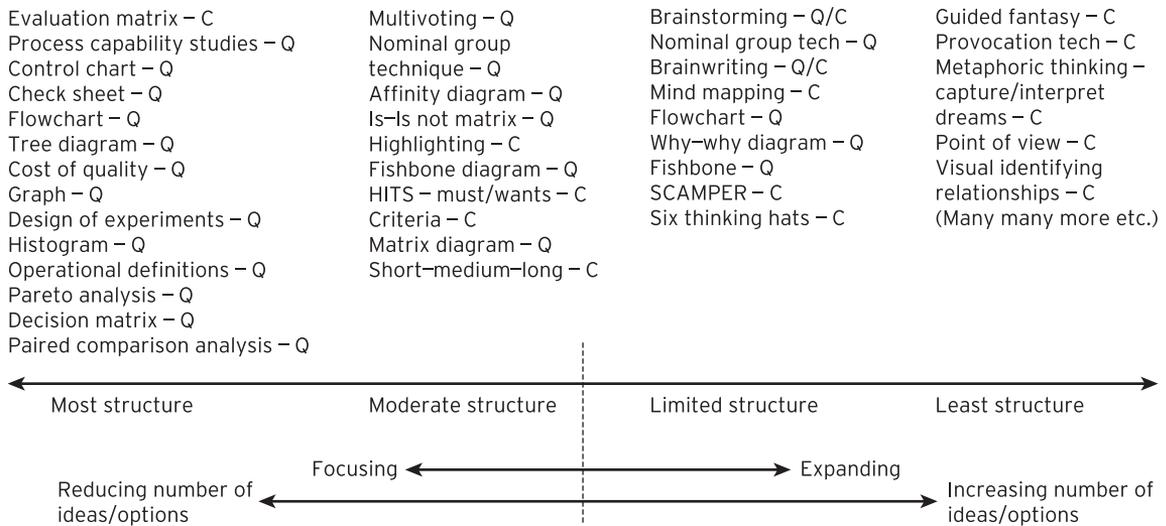
- Reducing cost and waste.
- Developing new products and services.
- Resolving long-standing customer complaints.
- Dramatically cutting down cycle time.
- Developing new processes or dramatic process improvements.

For instance, the field of quality from which a large number of process innovations have arisen has realised the importance of creativity. Creative tools have been added to the basic quality planning tools. The aim of this addition was to improve the continuous improvement processes but also to ensure that opportunities for radical innovation are not lost.

There are numerous techniques for exploiting human creativity, far too many to fully enumerate here. Many of them are similar, and can be classed into a few categories (see Figure 2.9). One common method of classification is based on whether the technique pertains to the individual or group, and another common method is categorisation by the form of activity. Perhaps a more useful way of categorising the techniques is on the relative amounts of structure and the role in focusing (convergence) or expanding (divergence) options. Figure 2.10 illustrates the range of available techniques for such purposes. Techniques of divergence and convergence need to be employed in a cycle. Initially, one wishes to develop as many alternative solutions. This needs to be followed by a screening process to select one that is the most useful or appropriate for the problem at hand.



**FIGURE 2.9** Creativity and quality tools for innovation  
 Source: Ritter and Brassard, 1998, with permission of GOAL/QPC



**FIGURE 2.10** Quality (Q) and creativity (C) tools for convergent and divergent thinking

Detailed description for the full range of creativity techniques is not possible. However, a select number of key techniques and the associated processes to execute them are elaborated in the section below. We confine our attention to association techniques (minimal structure), brainstorming (moderate structure), incubation methods (moderate structure) mapping techniques (higher structure) and the TRIZ system (highest level of structure).

### **Brainstorming**

Alex Osborn developed the traditional brainstorming technique in the 1960s. It is a technique that introduces an element of structure to free association. The technique is traditionally used to help groups of 6–12 people free associate ideas suggested by a problem statement. A facilitator or recorder commonly stands at a board or flip chart and records ideas as group members verbalise ideas in their raw form, as quickly as they occur. Activities here include:

1. Identify the appropriate team to conduct the brainstorming session.
2. Convene the team and clarify the topic and ground rules.
3. Generate ideas.
4. Clarify the ideas and conclude the brainstorming session.

Brainstorming discourages the ‘same old way’ of thinking by creating more and more ideas which the team can subsequently build upon. Used effectively, it engages all the team, and enthruses them by putting an equal value on every idea. These ideas can be as creative as the individual team members wish, yet enables them to remain focused on the team’s common purpose. Not only does this approach allow the known and obvious ideas to be identified, it also allows new ideas to emerge as the team members build on some of the ideas already posted.

Osborn drew up a set of four rules to increase people’s willingness to share their ideas with the group. Usually, the facilitator states or posts these rules at the start of a

brainstorming session – and, if necessary, politely corrects anyone who violates them. These rules are:

1. No criticism of any ideas. Save criticism for the evaluation stage.
2. Wild ideas are encouraged. Say whatever comes to mind.
3. Quantity, not quality. Generate as long a list as possible.
4. No proprietary ideas. Combining ideas or building on someone else's idea is encouraged.

The facilitator usually writes the problem statement for the group, making this a fairly directive method.

Once a list has been compiled, the groups critically examine the list of ideas, and work together to try to formulate several polished problem statements/solutions, which are then argued over and voted upon. In this manner, the group has a stronger hand in defining the problem, and brainstorming is used to bring creative insight to the initial stage of the creative process, often producing an 'out-of-box' problem definition that sets us off in a new and more productive direction.

### ***Exploratory brainstorming/benchmarking***

This is usefully applied during the early stages of any project or process.

Unlike traditional benchmarking, exploratory benchmarking is attuned to seeking novel approaches to a subject. You gather a hodgepodge of real-world examples, not all of which necessarily relate to your subject matter, and then find out just enough information about them to get the gist of what they are about or how they work. It is a quick sweeping process.

The product of exploratory benchmarking is an eccentric collection of designs or other ideas that may or may not be directly relevant to your subject but are certainly inspirational as you seek new approaches to the subject.

### ***Breakdown brainstorming***

This method is used to help groups explore complex problems or projects. It uses the free-association rules of brainstorming to generate as many sub-problems as possible.

Start by displaying and reading a formal statement of the problem to the group. Then point out that the problem statements tend to be fairly abstract and can often be broken down into sub-problems, or component parts.

The product of breakdown brainstorming is a lengthy list of sub-problems. Some of these will be very helpful in formulating creative solutions to the main problem, because they will surface aspects of the problem or suggest components of the solution that were not visible to the group when it tackled the problem on a higher level. Individuals can also use the method.

### ***Electronic Brainstorming***

In addition to the above, many creativity techniques have been enhanced by electronic and Internet media. This has increased the range of connectivity and sources of inspiration. Two techniques that are particularly amenable to this are the billboard and the chain letter.

#### **Chain letter**

This is used to get a large quantity of possible solutions outside of a formal meeting. In the chain letter, team members generate and pass ideas around via memo or e-mail. The steps in this approach are as follows:

1. Define your brainstorm objective.
2. Establish a medium and distribution method (paper or electronic, fax, internal mail, e-mail, etc., what's the order of routing and set a time frame for response).
3. First round, each person writes one or two ideas (then passes the letter on).
4. Next person builds on and/or adds to the ideas.

### **Billboard**

This technique is used to gather ideas from a broader range of people, in a non-meeting format. The billboard is a public brainstorming tool – manual or electronic (Pande et al., 2002), and includes the following steps:

1. Define your brainstorming objective.
2. Post a message in a public place asking for ideas (and include the objective) – using flipchart, or intranet, etc.
3. Gather ideas at end of a specified time frame, and narrow and select from them.
4. Remember to thank the people for contributing.

### ***Free association and creative association***

Idea association is one of the most basic building blocks of individual and group creativity. Yet, oddly enough, there is no specific discussion of it in the traditional creativity literature. Perhaps the best-known technique for idea association is free association, a rudiment of the Freudian psychoanalytical method. Most people are familiar with the exercise in which a person is given a word and responds with the first thought that pops into their mind; this is free association in its most basic form.

Free association is a valuable aid for creative thinking since it helps people make connections they otherwise might not see. However, creativity in the business sphere requires quite a focused and goal-orientated approach. Companies want ideas that are related to the topic in hand, including many that are related to it in non-obvious ways. They also want a lot of these ideas: a small, random sample does not help much on the problem-solving front. Because of these requirements the art of free associating was developed into an approach called creative association.

In creative association, you free associate so as to surface the many patterns and relationships that surround your topic and lead on from it, bringing to light related ideas along the way. This approach is facilitated by the mind's tendency to produce ideas and retrieve memories in groups, based on patterns that link them. The patterns can be formal and conscious, as when we recall that red, blue and yellow all belong to a group called colours. They can also be less conscious, even accidental – as when we think of 'shell' and 'bell' in response to the work 'sell', just because these words rhyme. An accidental or secondary association such as this one cuts a path across the more obvious (and generally more useful) categories, connecting seemingly unrelated ideas and grouping them in new categories.

Two simple variants of the association techniques are described below.

### ***Word associations and analogies***

Word association and analogy are often used to move a team that is trapped in traditional thinking by using random, unrelated words as a way to stimulate fresh perspectives and new solutions.

By describing a random word, object or situation in detail, unusual connections can be made to a problem. This provides a virtually unlimited supply of inspiration for

breakthrough thinking and enables all team members to create a new focus point for their thinking. It also helps re-energise the brainstorming process that has reached a lull.

1. Determine the source of stimulating words to use.
2. Define the problem clearly and brainstorm initial ideas.
3. Brainstorm associations or analogies that are stimulated by the selected picture or living thing:
  - a. an *association*: a mental connection that is triggered by an idea, a memory, a picture, or an event.
  - b. an *analogy*: a comparison of a primary characteristic, action or behaviour between two things.
4. Take the ideas identified in the previous step and re-state them as they apply to the problem.
5. Repeat the process as often as is helpful, using a new word each time.
6. Pool the best ideas.

### **Anti-solution**

This technique is used to open mindsets to see things differently and from different perspectives. Here, individuals are asked to brainstorm the opposite of what needs to be accomplished.

1. Define your brainstorming objective.
2. Create a new objective, opposite to the 'real' one.
3. Brainstorm based on the 'anti' objective (have fun and be wild).
4. Examine each 'anti' idea and see what positive idea it suggests.
5. Record the positive ideas and add to them as possible.

For example, how about an anti-ageing cream that puts wrinkles on you, makes your skin sag, leaves your skin greasy and smelly.

### **Incubation methods**

Incubation is the idea development that occurs when you sit on a problem for a while. The extraordinary value of this building block is well expressed by Bertrand Russell (1930, pp. 49–50):

*If I have to write upon some rather difficult topic, the best plan is think about it with very great intensity – the greatest intensity with which I am capable – for a few hours or days, and at the end of that time give orders, so to speak, that the work is to proceed underground. After some months, I return consciously to the topic and find the work has been done.*

Of course, workplace pressures conspire against such intensity. No sooner do we get started on a tough problem than a new message, report, or order distracts us. Thus anyone who wants to incubate an important problem effectively must take special care to 'think about it for days with very great intensity' ignoring the pressures to multi-task. Instead, they must focus only on the problem.

### **Cyclical creativity**

Cyclical creativity is a tool which helps teams incubate ideas. It involves fewer but longer work sessions, usually offsite or under 'lock down' orders to prevent interruptions. These

intensive sessions are punctuated by several-day breaks, during which team members incubate ideas associated with a given problem. In the first intensive session, it is recommended that the team or group be 'overloaded' with as much information about the problem as possible. In subsequent sessions, it is recommended that a variety of creativity tools and processes are introduced and used.

The essential feature of cyclical creativity is the use of focus/un-focus/focus cycles. Although retreat-type work sessions offer many advantages for facilitating these cycles, it is possible to effectively integrate them into a single meeting or work session.

#### Basic method

1. Alternate intensive blocks of work and meditative break periods.
2. Take the group through at least one full focus/un-focus/focus cycle.

#### Focus periods

1. Use focused brainstorming techniques.
2. Diagram or flow-chart the problem.
3. Gather data on the problem or analyse data on the problem.
4. Write a full description or report of the work to date on the problem.

#### Break periods

1. Structure break periods so that the problem and related ideas can 'percolate'. Don't get distracted by other problems – disconnection is the key.



### ILLUSTRATION

## How General Electric hatches its eggs

General Electric is constantly striving for innovation. Driving this are three simple management tools: the management workout, best practices and process mapping.

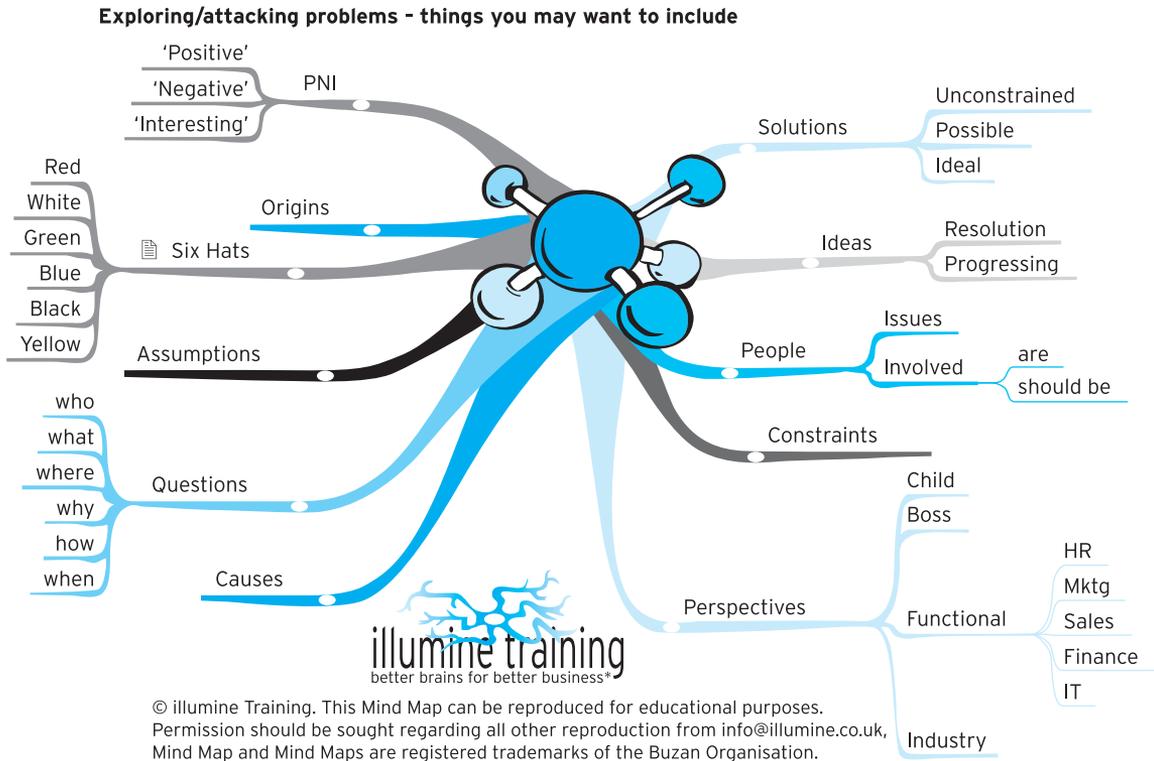
**The workout:** A manager and his subordinates gather for a three-day retreat. The subordinates are given a set of problems to work on with the help of an outside facilitator. The manager is not allowed to participate in these sessions. On the third day, the manager is presented the solutions proposed by the subordinates. He has to respond with a yes, no or deferral for further study. The managers are encouraged to limit their deferral response.

**Best practices:** GE compares itself against other firms that are considered to be best in class in a particular function. GE then begins a process of study to improve its own performance by attempting to emulate the practices of these leading class companies.

**Process mapping:** The employees make a flow chart of a particular process. The flow chart breaks down the process and the product into its component and related parts. The employees are then set the challenge of how much time they can cut out of the process, and how they can improve the product. GE halved the time it took to manufacture aircraft engines through process mapping.

### Mapping methods

Mapping methods are used to graphically break down a broad goal or problem into increasing levels of detail to better understand the existing knowledge about it.



**FIGURE 2.11** Mind map example (exploring/attacking problems)  
 Source: Mind mapping examples from Illumine Training Ltd, 2008. Reprinted with permission

**Mind mapping**

This allows a team or individual to generate an enormous number of ideas by branching each idea into many more detailed ideas. The ideas in each branch can either be loosely or tightly connected with the ‘limb’ from which it grew. To create a mind map like that shown in Figure 2.11, follow these steps:

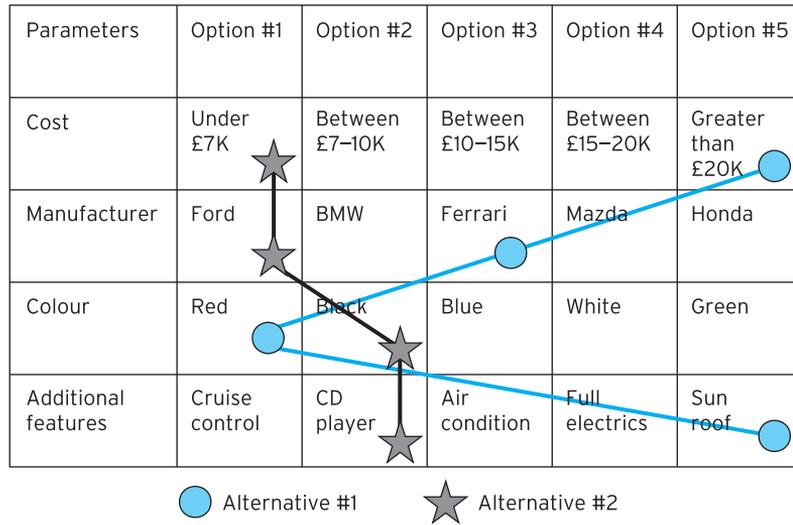
1. Write the topic (or draw a picture that represents it) in the centre or extreme side of a sizeable piece of paper.
2. Brainstorm ideas around the topic. For each major idea, draw a line directly from the main topic.
3. For each new idea, decide whether it is a new theme or a variation on an existing idea. Record ideas on the lines as they are generated.
4. Continue thinking, drawing and recording until the ideas (of the people involved) are exhausted.

**Morphological box**

This is used to map out all the combinations of potential solutions that address the essential parts of a problem.

**Sample problem:**

How can I determine which car is best for me?

**FIGURE 2.12** Example of a morphological box

It helps identify all parts of the problem that must be addressed to reach a successful solution. It builds a table that helps to display options for solving each essential part of the problem and allows the team to evaluate several solutions at one time (see Figure 2.12).

To do this:

1. Assemble a knowledgeable team.
2. Define the parameters that are necessary for any solution to the problem (a parameter being a characteristic that a solution must possess in order for it to be effective). Good parameters must be independent from other parameters, and create a complete solution when combined with other parameters.
3. Generate options for each parameter.
4. Build alternative solutions by linking different options.
5. Analyse the alternative solutions and select the best ones.

**TRIZ: a structured methodology for creative problem solving**

Whilst the above creativity tools work well as separate components, a number of structured systems for creative problem solving have been developed. From amongst these the most useful and increasingly prominent system is the TRIZ system. TRIZ is based on the work of Russian engineer Genrich S. Altshuller. Altshuller developed a system that he called ARIZ (a Russian acronym for Algorithm for Inventive Problem Solving). This was refined further by his students into TRIZ (Theory of Inventive Problem Solving). At the centre of the TRIZ process are five innovation patterns that emerged from Altshuller's historical scrutiny of innovations.

**Pattern 1. Subtraction:** In developing new products there is a tendency always to add features. The principle of subtraction works in reverse. Instead it takes away features from

the product to look for developmental insight. For instance, caffeine from coffee leads to caffeine-free. Similarly, the principle can be used for other foods. For instance, in modern health-conscious society, subtract the fat for fat-free versions of the product. This can be used for other product categories to simplify and improve. Subtract a vacuum tube from a TV, what do you get? A slim-line plasma screen TV?

**Pattern 2. Multiplication:** This pattern requires adding a copy of an already existing component, but doing so in a way that alters the copy in some fundamental way. Perhaps the easiest example of this is adding an extra blade to a shaving razor. However, strictly speaking the extra addition must be altered in some way. For example, if the addition of the second blade is at a slightly different angle to allow for a closer cut following the skim of the first blade.

**Pattern 3. Division:** This principle operates by breaking the product down into its component parts, and then re-configuring it in some anticipated way. Let us use the old TV example again, for illustration. Imagine it is an old TV, say from 20 years ago. It has a screen, a base, on-off buttons, electronic circuits, etc. This is not how it came about, but the principle of division could potentially have led to the separation of the on-off buttons from the TV, i.e. led to the development of the remote control.

**Pattern 4. Task unification:** This principle sets the task of embedding a task or function into an existing element or component of the product. The most common example of this is embedding a car radio antennae function into the defrosting filament on the windscreen. By doing so, the car is more streamlined and you do not have to worry about remembering to ensure that it is drawn in when taking it to a car wash.

**Pattern 5. Attribute dependency:** This focusses on the relationship of the products and its attributes to its immediate environment. For example, in a car the pedals could be designed specifically in relation to its user (male or female). Let us say the attribute relationship is to be made with a female: the pedals are set in a way that allows higher heels and accounts for smaller foot-span. Or the relationship could be in terms of seat and height of individuals, thus leading to a seat that raises or lowers and expands or reduces leg-space.

The strength of this technique is its systematic decomposition and anchorage in a current product to drive development and improvement. Creativity techniques that start with a blank make it quite difficult to come up with something meaningful. Sometimes it is very difficult to come up with anything. As an experiment, just test yourself. Try and come up with something new, anything. Give yourself one minute to do so. Did you? Now, just pick up something and try and apply the above principles. Which one of the two methods led you to the most productive and innovative result? Most people find the second, since as a framework it directs your mind to use particular heuristics to reach the end goal. This makes it easier.



## We've been creative: now what?

Going 'live' with a concept or product is often harder than striking the right spark in the first place. Many obstacles populate the enormous divide between vision and reality – between knowing what you want and actually doing something to make it happen.

Having the idea is just the beginning of the innovation process. To create a successful innovation the idea must undergo the often long and arduous task of implementation. Only if an idea can successfully negotiate the many obstacles in its way can it press the light of

innovation. The structured methodologies of new product development are designed to help negotiate this path of uncertainty and ‘fears’. Unfortunately, such structured methods exist only for the development and implementation of product ideas. Process and other innovation ideas have to chart a highly unstructured and sometimes ad hoc process. Implementation of process ideas is dependent on a complex web of organisational factors: management acceptance, resource availability, organisational commitment and so on. To get adoption of a new idea is no easy task. This is particularly so if the organisational culture, systems and management thinking are not accommodating towards new ideas. It is an unfortunate fact but many good ideas, especially process and organisational innovations, fall by the wayside simply because the organisation, particularly its management, either fails to appreciate the value of the idea or is simply resistant to change. In these companies, managers are busy protecting their status quo and operating in their comfort zone. It is no coincidence that these companies also have systems and practices that stifle and suffocate the emergence of new ideas. In later chapters we return to examine these organisational issues.



## Conclusion

Creativity is the production of novel and valuable outcomes. Creativity plays a key role in innovation since it helps to define problems, solve them and even sometimes anticipate them. Creativity must be tapped at all stages of the innovation problem-solving and solution-finding process. It should not be confined simply to trying to generate new ideas. It is required for problem identification, problem selection and problem preparation. It is therefore important in developing innovative ideas and solutions, as well as installing and implementing the chosen solution. In other words, creativity spans the whole spectrum of innovation activity.

In this chapter we found that some approaches to organisation enhance creative performance whilst others dampen and stifle it. Hierarchical and bureaucratic organisational designs appear to be antithetical to innovation and creativity.

Innovation and creativity are phenomena that depend upon both the individual and the collective expertise of employees. Whether observed as an outcome embedded in new products, services, improved organisational structures or processes, creativity is rarely an individual undertaking. It requires managing the individual as well as the collective of employees’ skills, knowledge and experience. Management of the individual and teams necessitates paying attention to a range of factors. Skills, competences and capabilities (intelligences) of employees need to be developed and enhanced. This can be done through a wide range of processes, such as training in creativity tools and problem solving as well as ensuring that jobs are designed to provide sufficient scope for creative performance. Each employee’s specific predispositions and preferences towards problem solving need to be identified and managed in order to maximise their potential to contribute to organisational improvement and success. Whilst attending to these concerns, companies must take great care in constructing systems that reinforce creative behaviour and innovation. They need to examine their measurement and rewards systems, their structures and processes, their culture and the signal and behaviours of their leadership. All of these work together to weave a complex and intricate web of influence over acts of creativity and innovation.

## QUESTIONS

1. Why is creativity important over the entire spectrum of innovation activity? What problems are experienced by companies that use only the idea-generation phase of the product development process?
2. What are the key steps in the creative process?
3. What factors stop creativity happening in the workplace?
4. Is creativity simply personal and individual? Explain why or why not.
5. You can't make people creative. They either have it or they don't. Do you agree?
6. Why do organisations frequently fail to tap into the right-brain thinking of their workforce?



## CASE STUDY

### As Innocent as a drink

Dan Germain, Head of Creativity at Innocent Drinks argues that creativity must be maintained in the fast growing company.

Innocent Drinks started in 1999. Dan Germain commented 'Try as we might to keep things as they are, we'll just have to face facts – our company is hopefully going to get a bit bigger. And we all know that once you get a bit bigger, you get a bit lazy; you stop caring; you cease to love the business that you took such care to nurture. And things get rubbish. That is what always happens'.

How could the company keep hold of its original spirit and keep on doing all of the creative things that made it special. There was unease that as the company becomes bigger, the less creative and fun it would get. According to Germain, this idea is un-revolutionary but it is surprising how many companies always just come up with product re-launches and new brand philosophies in order to try to keep their spirit intact.

Innocent is highly selective in hiring people. It uses interviews to ascertain skills and aptitude, but also screens for people who are 'innocent' – individuals who will fit in and enjoy themselves and take the initiative.

#### The people manifesto

**Clarity** is making sure that everyone knows what Innocent wants to do as a company. It means making sure that each individual knows his or her part. People love knowing how they can make a difference, so you should tell them, and make sure that they know how their work will make Innocent a mighty place.

**Responsibility** is about letting people get on with their job. Let them be the experts in their area, let them make mistakes and let them change things that could be better.

**Fraternity** means celebrating all of the good stuff: rewarding people for teamwork, and fostering an open, informal culture where people can say what they want without fear of recrimination.



When Coca-Cola made a minority investment in 2009, the founders commented: 'The three of us who set up the business will continue to run and manage Innocent. We will be the same people making the same products in the same way. Everything that Innocent stands for, remains in place – to only produce natural, healthy stuff; to push hard for better quality, more socially and environmentally conscious ingredients; to find more efficient and environmentally friendly ways of producing and packaging our drinks; to support charities in the countries where our fruit comes from; to have a point of view on the world, and to not take ourselves too seriously in the process. In fact, this deal will simply allow us to do more of these things.

'As we said, Coca-Cola is a minority investor. They have a small stake of between 10–20 per cent, which they paid £30M for. We chose Coca-Cola as our minority investor because as well as providing the funds, they can help us get our products out to more people in more places. Plus, they have been in business for over 120 years, so there will be things we can learn from them. And in some small ways we may be able to influence their thinking too.

'Innocent is ten years old this year. We sold 24 smoothies on our first day, back on 28th April 1999. This week, we will sell approximately 2 million.'

## QUESTIONS

As the company develops following the investment by Coca-Cola:

1. How is it likely to change?
2. What impact is this likely to have on innovation and creativity?
3. What should Innocent be doing to adjust to these changes?

(Source: Based on Germain, 2005 and [www.innocentdrinks.co.uk](http://www.innocentdrinks.co.uk), 2009. With permission from Innocent Ltd).

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