

# CHAPTER 1

## FUNDAMENTAL CONCEPTS

*Creativity is an act of liberation. It is  
the escape from the jail of routine.*

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## 1. Introduction

The main purpose of this chapter is to give a holistic view and an introduction to the different elements of modern problem solving based on some concepts from creative thinking and systemic problem solving. Modern frameworks, concepts, approaches, methods and tools will be introduced in an interdisciplinary manner. These themes will be the subjects of the following chapters of this book.

Social intervention with the purpose of problem solving can be regarded as a performance. The scene with the different actors, the problematic situation and the problem solving approaches, as well as their interaction will be presented in Section 2. What is central in this framework is the focusing on social processes. Some real-life examples illustrate the main concepts. The problem solving process outlined in Section 2 is a *participative social intervention* that can be carried out in different forms; three of these forms are discussed in Section 3.

In Section 4, three different problem solving approaches are outlined. In addition the role of creative thinking and creative methods in these approaches are also enhanced. Research on creativity within several disciplines has been intensified during the last two decades. First, in Section 5, the concept of creativity will be elucidated, and then in Section 6, an outlook of creativity research relevant to the theme of this book will be depicted. In this section, the concept of group creativity will also be discussed. Group creativity is an essential element in all the approaches and tools discussed in this book.

The facilitation of group work in creative problem solving is a central theme in this book. Therefore, the anatomy of group work is outlined in Section 7 while the art of facilitation is presented in Section 8. Some simple but very useful creative tools are Brainstorming, Mind Mapping, and SWOT analysis; these will be introduced in Section 9. In Section 10, the creative methods to be discussed later in this book are shortly outlined. The last section, Section 11, is devoted to sketch some barriers to creative work.

## 2. The Scene

The point of departure in our discussions is the concept of an *organisation*. An organisation can be a family, a group of people, a community, a corporation, or a public institution. What characterises organisations is that there are purposefully designed and specialised to achieve a task. Thus an organisation in a community could be a centre designed to enforce the development of the region, while firms are organisations providing some products and profits, and institutions are organisations designed to provide some services.

The evolution of organisations is conditioned by external and internal factors, and sometimes organisations are experiencing *problematic situations or messes*. These are complex situations where some purposeful action is demanded to achieve some goals and visions. Problematic situations are usually related to the introduction of new technology, the re-design of the organisation, the development of new strategies for the organisation, the formulation of new visions for the future, or problem solving in general.

In such a situation, the organisation will usually appoint *a work group* to deal with the problematic situation. The *task* of this group is to analyse the mess and answer the question: What is to be done? In other words, to propose an *action plan* to be approved by the *decision-makers* of the organisation. In small organisations the decision-makers (managers) are usually part of or identical to the work group. Related to these persons we have the so-called *stakeholders*, those individuals outside or inside the organisation that can either affect or be affected by the action plan, see Figure 1. Let us see two examples to clarify the above-mentioned concepts.

**Example 1: A small firm**

The organisation in question is a small firm in a retail business. The problematic situation is to what extent to engage in e-businesses as demanded by the bigger partners in the supply chain and what will eventually be the configuration of the technological platform to be used (to develop an IT strategy). The situation is also problematic because the organisation has neither the technological background to identify different technological alternatives nor the experience and knowledge for dealing with problematic situations. Management (the decision-makers) has appointed a work group to deal with this mess in a creative way. The stakeholders are: the shareholders, the suppliers and the different type of purchasers.

**Example 2: Community work**

The organisation in question is a Development Centre in Odsherred (DCO), a vulnerable local region of Denmark. This is an autonomous non-profit organisation which main objectives are to strengthen, develop, and inspire to all type of cultural, social, environmental, and commercial activities in the region. Local innovators, in close co-operation with the relevant stakeholders of the region, carry out projects. These projects as well as the DOC itself are financed through a mix of sources: public funds, private funds, sponsors, business activities, and LEADER+, an EU-program that supports development in vulnerable regions of the countries that are members of the EU (see further Chapter 2).

The problematic situation is the development of common images of ideas, projects, visions, and objectives for the region in question. These visions and objectives will be used to select the projects to be supported by the LEADER+ program. The DOC's board (the decision-makers) appointed a work group to deal with this situation. The stakeholders are: NGO's from the region, the business community, trade unions, local innovators and officials from the different municipalities of the region.

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To deal with messes, it is recommendable for the work group to hire *a facilitator*. A facilitator will support the group in the *creative problem solving process*; he or she will secure that the problem solving process ends with an action plan. The facilitator is usually the manager of the problem solving process. The facilitator could also give some expert know-how or find out if some experts have to be hired to give specialised advice. Often, the facilitator is a professional that has some technical expertise, for instance within information technology, so that he or she could also be the expert.

To perform his job as process manager, the facilitator uses some *approaches, methods and tools* that he/she finds suitable for the given situation. The problem solving approaches could be quantitative (hard), qualitative (soft), participative (critical), innovative (creative) or a combination of them (multi-methodology), see further Vidal (2006). To facilitate groups demand the ability to both design and manage problem solving processes, creating a pro-active atmosphere and synergetic effects. Fig. 1 summarises all the elements and concepts discussed above, these will be further elaborated in the rest of this chapter.

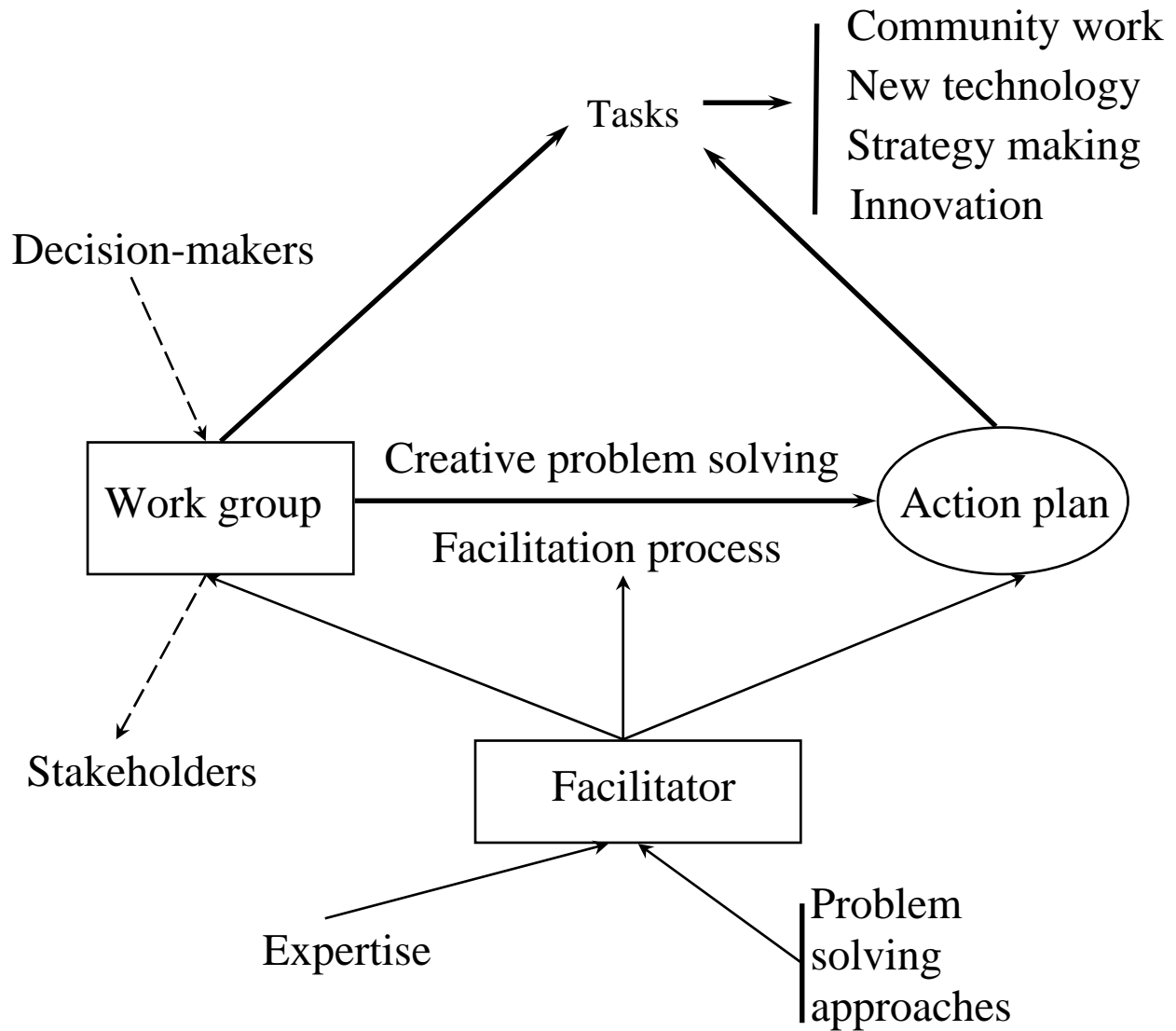


Figure 1. A framework for participative problem solving

**Example 1 (continued)**

In the above-mentioned example the facilitator was a student working in his MSc thesis to obtain a degree in Computer Engineering and Operational Research. The facilitator was also the technical expert. The problem solving process had duration of around 3 months. The facilitator used several soft approaches during the problem solving process. The final product was an action plan elaborating the different realistic alternatives and a proposal for the decision-makers. The whole case study has been reported in Sørensen, Vidal, and Engström (2003).

**Example 2 (continued)**

The director of DOC contacted the author of this book to support in the organisation and facilitation of a Vision Conference. The purpose of this conference was both:

- To generate visions and projects that will create a sustainable development of the region, and
- To learn how to facilitate groups, a tool that will be used during the implementation process of the LEADER+ program.

The facilitator designed and managed the Vision Conference where a creative process and several creative techniques were used. The final result was a long list of potential projects for the future. This portfolio will be used in the debates of the DOC's board while allocating funds to some selected projects. This case study will be further discussed in Chapter 2.

**3. Social Interventions**

In the two examples mentioned above, we have in principle two different kinds of social interventions. In the first one, denominated *research-driven intervention*, it is the facilitator as a researcher that takes the initiative to find a real-life case study for his MSc thesis. His objective is to test a problem solving approach and to evaluate the applicability of some methods. Obviously, the client or user will benefit by learning about the problematic situation, but there are not doubts about whose needs are ultimately driving the inquiry and helping process. This kind of intervention is quite similar to the type of interventions carried out under the name Action Research, a sociological school introduced by Lewin (1948). When he first formulated Action Research it was clearly a case of the researchers wanting to figure out how to be more successful in implementing some changes that the researcher desired. He found that by involving the targeted population in the research process, they became more amenable and committed to the desired change. But the initial drive came from the change agent and it was the change agent's goals that were driving the intervention. This research practice involves the client system in the researcher's agenda even though the client system might ultimately be the beneficiary. But the client did not initiate the process and it was not the client's needs that drove the process. It was the researcher's choice to involve the client in his research process.

The second example illustrates what is known as a *user-driven intervention*. The work group was composed of professionals covering different disciplines and with experience in problem solving within their own fields. In this case study, it is the client's needs that

is driving the inquiry and supporting process. During the problem solving process the work group will need support from experts, as for example the organisation of a conference and the teaching of facilitation tools. In this mode of intervention learning is a very important aspect of the problem solving process, because next time the users will organise a similar conference without an extern facilitator and facilitation will become a tool in their future work. This form of intervention is usually found in the praxis of many consulting disciplines as for instance Systems Sciences, Management Sciences, Computer Sciences, and Operational Research.

A third mode of intervention is denominated *participative intervention*, where both the work group and the facilitators co-operate and collaborate from the very beginning in the design of a creative problem solving process to deal with the problematic situation. This form of intervention is usually necessary when there is a need of both the practical experiences of the work group and the methodological and other expert knowledge from the facilitators. This mode of intervention can be regarded as a synthesis of the other two modes described previously.

### **Example 3: Organisational design**

In March 2001, a group of tapestry weavers in Denmark decided to take the initiative for creating an organisation to develop and implement a strategy that can give their profession a badly needed innovation and produce new impulses to give the profession visibility and better working conditions in the whole Europe. They wanted to create an organisation of tapestry weavers in Europe: The EUROPEAN TRAPESTRY FORUM (ETF for short), a European umbrella forum based on the national organisations. ETF should support both permanent and recurrent activities financed by the European countries and the EU. This organisation was designed at a workshop conducted in March, 2001, for a group of tapestry weavers from North Europe, and facilitated by the author of this book. This was an example of facilitated participative intervention to be further discussed in Chapter 3.

## **4. Problem Solving Approaches**

In 1981, Ackoff (1981) published a paper entitled: *The art and science of mess management*. He argued that there are three actions that can be done about problematic situations:

- The *clinical or intuitive approach*, where you select actions that are good enough, that *satisfies*; it relies heavily on past experience, it is qualitatively oriented, and it is rooted deeply in common sense making use of subjective judgements and intuition. This approach can be supported by soft or qualitative methods.
- The *research or rational approach*, where you select actions that are the best possible outcome, which *optimizes*; it is largely based on scientific methods; it is quantitative oriented, and it makes use of mathematical and computer models aspiring to complete objectivity and rationality. This approach is usually supported by hard or quantitative methods. And
- *The design or creative approach*, where you seek to change the nature, and the environment of the problem so as to remove the problem, it *dissolves* the problem; it *idealizes* rather than satisfies or optimizes because its objective is to change the

system involved or its environment in such a way as to bring it closer to an ultimately desired state, one in which the problem cannot or does not arise; it is innovative oriented and it make use of creative and participative approaches aspiring dissolution in the containing whole.

The last approach is based on interaction of the two first approaches, practical experience and scientific based approaches, but he adds design, invention, creativity, participation, and facilitation. This is the art and science of problem solving. The facilitator is both the artist and scientist supporting a group to deal with a mess. As a scientist, he will be using when needed scientific approaches, experimentation, simulation and mathematical modelling in the problem solving process. As an artist, he will metaphorically speaking be like a painter who combines colours and shapes (the participants in the process) to create an art work (the problem solving process). Or, the facilitator is the director of a theatre performing a piece of art. Several case-studies will be presented in Chapter 7.

Creative thinking and creative methods might be used in all three approaches, but they are necessary elements in the design approach. Referring to Figure 1, creativity thinking and creative tools can be present in:

- The group work,
- The problem solving process, and
- The facilitation process.

## 5. Creativity

E. Paul Torrance (Millar, 1997) was a pioneer in creativity research and education for more than 50 years. Torrance sees creativity as a process and has developed a battery of tests of creative thinking abilities. He believes that all individuals are creative and that creativity can be enhanced or blocked in many ways. He considers creativity *developmentally*, opposite to those who believe that a persons creativity was established at an early age (two or three years old), however his research has shown that creativity does not develop linearly and that it is possible to use activities, teaching methods, motivation and procedures to produce growth, even in ageing. Torrance asserts that creativity is an infinite phenomenon; you can be creative in an endless manner.

What is creativity?

"Creativity defies precise definition. This conclusion does not bother me at all. In fact, I am quite happy with it. Creativity is almost infinite. It involves every sense - sight, smell, hearing, feeling, taste, and - even perhaps the extrasensory. Much of it is unseen, nonverbal, and unconscious. Therefore, even if we had a precise conception of creativity, I am certain we would have difficulty putting it into words."

E.P. Torrance (1988)

**E. Paul Torrance**, born on a farm in Milledgeville, Georgia in 1915, received his undergraduate degree from Mercer University. He went on to receive his master's degree from the University of Minnesota and his doctorate from the University of Michigan. He began his professional career as a high school and junior college teacher, counsellor and administrator, developing his first creativity test at Georgia Military College. In 1945, he became a counsellor of disabled veterans at the University of Minnesota Counselling Bureau. He was inducted in the U.S. Army and served as a psychiatric social worker and psychologist where he interviewed, tested and counselled men who had been court marshalled. Upon his discharge, Torrance joined the counselling bureau at Kansas State University and later became dean of men, counselling bureau director and professor of psychology. In 1951, he became director of the Survival Research Field Unit of the U.S. Air Force Advanced Survival School. In 1958, he returned to the University of Minnesota and served as director of the Bureau of Educational Research until 1966.

Torrance also spent time in the world of academia, serving in the Department of Educational Psychology at the University of Minnesota and the University of Georgia, the latter of which he chaired. As UGA professor of educational psychology, he invented the benchmark method for quantifying creativity and arguably created the platform for all research on the subject since. The "Torrance Tests of Creative Thinking" helped shatter the theory that IQ tests alone were sufficient to gauge real intelligence. The tests solidified what heretofore was only conceptual – namely that creative levels can be scaled and then increased through practice.

In addition to developing the most widely used tests of creativity, Torrance also created the Future Problem Solving Program, and developed the Incubation Model of Teaching. He authored dozens of books and more than 2,000 published articles on creativity during the course of his career, making him one of the most published faculty members in UGA's history.

He remained prolific after his retirement, writing several new books on creativity. Some of his best-known books are *Guiding Creative Talent*, *Rewarding Creative Behavior*, *The Search for Satori and Creativity*, *The Incubation Model of Teaching*, and *Mentor Relationships and Why Fly?* His most recent books are such co-authored works as *Gifted and Talented Children in the Regular Classroom*, *Multicultural Mentoring of the Gifted and Talented*, *Making the Creative Leap Beyond*, and *Spiritual Intelligence: Developing Higher Consciousness*. Torrance's 2001 book, *Manifesto: A Guide to Developing a Creative Career*, includes the results of his 40-year longitudinal study of creativity – the only one of its kind

The Torrance Center for Creative Studies, based in the College of Education's department of educational psychology, UGA, was established after Torrance's retirement in 1984 to continue his scholarly inquiry into the study, development and evaluation of gifted and creative abilities in individual from diverse age groups, cultures, and economic backgrounds. Torrance died on July 12, 2003.



You find creativity in many apparently different areas: humour (ha-ha), science (aha) and art (ah). Koestler (1976) presents the theory that all creative activities - the conscious and unconscious processes underlying artistic originality, scientific discovery, and comic inspiration have a basic pattern in common, he calls it "*bisociative thinking*" - a concept he coined to distinguish the various routines of associative thinking from the creative jump which connects previously unconnected frames of references and makes us experience reality on several planes at once. Koestler introduced the concept of a "*matrix*" to refer to any skill or ability, to any pattern of activity governed by a set of rules - its "*code*". All ordered behaviour, from embryonic development to verbal thinking is controlled by the rules of the game, which lend it coherence and stability, but leave it sufficient degrees of freedom for flexible "*strategies*" adapted to environmental conditions. The term code is deliberately ambiguous, and reflects a characteristic property of the nervous system: to control all bodily activities by means of coded signals.

The concept of matrices with fixed codes and adaptable strategies is proposed as a unifying formula, and it appears to be equally applicable to perceptual, cognitive, and motor skills and to the psychological structures variously denominated frames of reference, associative contexts, universal discourse, mental sets, schemata, etc. Koestler has shown the validity of this formula from morphogenesis to symbolic thought. Matrices vary from fully automatized skills to those with a high degree of plasticity; but even the latter are controlled by rules of the game which function below the level of awareness.

It is difficult to give a simple and general definition of creativity. It is easier if we restrain to study creativity in relation to problem solving tasks as formulated in Section 2. Herrmann (1996) gives a short definition that encapsulates many other definitions presented in the literature:

"What is creativity? Among other things, it is the ability to challenge assumptions, recognize patterns, see in new ways, make connections, take risks, and seize upon chance."

Let us elaborate a little more on this definition: Challenge assumptions means questioning the basis of the problem formulation; recognise patterns because usually chaos and complexity are caused by simple patterns which, when recognised, lead us to the solution to the problem; see in new ways means looking for patterns from different perspectives: a rational or logical, an organisational or procedural, an interpersonal or emotional, and an experimental or holistic; make connections, or bisociate, because many creative ideas are the result of synergy occurring between two thoughts or perceptions; take risks because there always exists the probability that your ideas will lead to failure due to many factors out of your control; and seize upon a chance means to take a calculated risk in order to take advantage of an opening that will allow to move forward toward a creative solution.

### **The creative person**

We can identify at least three types of creative persons. First, the problem solving one where the person (subject) is trying to solve a problem (object) in a creative way, this is the case of doctors, engineers, scientists, advisers, etc. that is problem solvers in general. Secondly, the artistic person (subject) who creates a new piece of art (object) usually it will be a close interaction between the subject and object, the “soul of the artist” will be in the object; this object can be a product (painting, music, film) or a process (dance, theatre, performance). And thirdly, the persons that adopt creativity as a life-style being creative at work, at home and everywhere, both in an extrovert and introvert way (inventors, artists, mode designers, etc).

Maslow (1987) distinguishes between "special talent creativeness" and "self-actualising creativeness" and he found that creativity is a universal characteristic of self-actualising people. Self-actualisation may be described as the full use and exploitation of talents, capacities, potentialities and the like. Such people seem to be fulfilling themselves and doing the best that they are capable of doing. He identified the following characteristics of self-actualising creativeness:

- Perception or fresh appreciation and wonder of the basic good of life,
- Expression or ability to express ideas and impulses spontaneously and without fear of ridicule from others,
- Childlike or innocence of perception and expressiveness, natural, spontaneous, simple, true, pure and uncritical,
- Affinity for the unknown,
- Resolution of dichotomies or the ability to synthesise, unify, integrate, and
- Peak experiences or fearless, wonderful, ecstatic experiences which change the person and his/her perception of life.

Their codes of ethics tend to be relatively autonomous and individual rather than conventional. They regard upon the world with wide, uncritical, undemanding, innocent eyes, simply noting and observing: what is the case? without either arguing the matter or demanding that it is otherwise. Self-actualising creativeness is "emitted", like radioactivity, and it hits all of life, regardless of the problems.

Individuals exhibit various degrees of creativity throughout their lifetime. Usually, we have settled into a pattern or style of creative thinking. Just as it is valuable to understand your locks to creativity, it is important to understand your own style of creativity. Each of us has different personalities, although we all have the ability to be creative, personal differences and preferences cause us to approach creative problem solving in different ways. This is very central especially while working in groups, because each person has a contribution to make due to his or her unique profile. Creative groups are very effective if different styles of creativity are combined, to stimulate our thinking in different directions and to cause us to re-think our usual approaches.

Miller (1989) has developed a questionnaire that helps persons to identify their style of creativity. It is founded in three assumptions:

- Each person has the ability to think creatively, the main issue is: How is he creative?

- Each person has equal potential for creativity, but persons have different approaches to making change when they work, and
- There is not a single style, but a combination of styles, yet still each person has a favourite style.

A person's creativity style is founded in how he uses information to stimulate his creativity. Each creativity style prefers a different method for generating and evaluating ideas. Miller's research shows that preferences for style can be classified in four categories:

- *The modifying style* likes to ask: What can we adapt to improve upon what has worked before? These people are more comfortable working with facts and making decisions. They seek solutions using methods that have worked before. They are precise, reliable, efficient and disciplined.
- *The visioning style* likes to ask: What can we realistically image as the ideal solution over the long term? These people trust in their intuition and like to make decisions. They seek solutions that focus on maximising potential. They are persistent, determined, hard working and visionary.
- *The experimenting style* likes to ask: What ideas can we combine and test? These people emphasise fact-finding and information gathering. They seek solutions by applying pre-established processes and experimental trial and error. They are curious, practical, and good team players.
- *The exploring style* likes to ask: What metaphors can we use to challenge our assumptions? These people like using their insights to guide them. They collect lots of information hoping that it will help to approach problems from different angles. They are adventurous, dislike routine, and like to be challenged.

Amabile (1983) has documented that creativity in each individual has three components:

- Expertise,
- Creative-thinking skills, and
- Motivation.

Expertise is in a few words knowledge in its many forms: technical, procedural and intellectual. Knowledge can be acquired both theoretically and practically. Learning to learn is an important tool for becoming an expert in modern Society. Creative-thinking skills determine how flexibly and imaginatively people approach problems and tasks. It demands courage to be creative because you will be changing the status quo. According to Amabile, individuals can learn to be more creative and can learn to use creative tools in problem solving. Motivation is the last component. An inner passion and desire to solve the problem at hand will lead to solutions far more creative than external rewards, such as money. This component, usually called intrinsic motivation, is the one that can most immediately be influenced by the work environment. Amabile's research has identified six general categories that support creativity: challenge, freedom, resources, work-group features, supervisory encouragement, and organisational support.

Amabile (1998), after many years of research focusing on creativity within organisations has also concluded that individual creativity gets killed much more often that it gets

supported. Mostly, it is not because management has a vendetta against creativity, it is undermined unintentionally because of the optimisation of short business imperatives: coordination, productivity, efficiency and control. Her research has shown that it is possible to develop organisations where both profit and creativity flourish, but you need a conscious strategy. Torrance's research has also shown that children's creativity gets killed in the primary schools and it is possible to design schools and education systems where both rational and creative work flourishes. Amabile has drawn attention to the crucial importance of intrinsic motivation in creative endeavour. Business has traditionally rewarded people extrinsically with pay and promotion but creative actions often arise out of a long-standing commitment to and interest in a particular area. She appreciates this is only one part of the equation, and that expertise in the domain concerned, and sufficient mental flexibility to question assumptions and play ideas, are also important. In addition, she points out the critical importance of challenge, for instance, matching people to tasks they are interested in and have expertise in, permitting people freedom as to how they achieve innovation, setting a sufficiently diverse team the task of innovation, along with sufficient resources, encouragement and support.

### **The Systems view of creativity**

Creativity is usually seen as a mental process but creativity is also a cultural and social activity. Csikszentmihalyi (2001) asserts that any definition of creativity will have to recognise the fact that the audience and social environment is as important to its constitution as the individual or group who is producing novelty. This environment has two main aspects:

- The *domain*, a cultural or symbolic aspect, and
- The *field*, a social aspect.

For creativity to occur, a set of rules and practices must be transmitted from the domain to the individual. The individual (or a group) must then produce a novelty in the content of the domain. The field for inclusion in the domain then must select the novelty.

Creativity occurs when a person (or a group) makes a change in a domain, a change that will be transmitted through time. But most novel ideas will be forgotten if some group does not accept them entitled to make decisions as to what should or should not be included in the domain. These gatekeepers are the field. The field is the social organisation of the domain, those who decide what belongs to a domain and what does not. Therefore the occurrence of creativity is not just a function of how many gifted individuals there are, but also of how accessible the various symbolic systems are and how responsive the social system is to novel ideas.

Csikszentmihalyi has outlined a systems theory of creativity, relating creative effort by individuals to the state of the domain they are working in and the characteristics of those who assess the worth of the creative endeavour in the field concerned. This offers a penetrating analysis of how creative endeavour emerges within a social field. Drawing on years of research in the field, he hypothesises about the interplay between knowledge about the domain, gatekeepers in the field and creative individuals. In addition, many of the points made by him in relation to other domains apply equally well to creativity and

innovation in organisational settings. Csikszentmihalyi has drawn attention to the social context out of which creativity and innovation emerge. For example he has demonstrated the beneficial role of working at a place and time in which other individuals are engaged in related creative activities.

Creativity quotes:

- Creativity involves breaking out of established patterns in order to look at things in a different way (Edward de Bono)
- Creativity in science could be described as the act of putting two and two together to make five (Arthur Koestler)
- Creativity is a natural extension of our enthusiasm (Earl Nightingale)
- Creativity requires the courage to let go of certainties (Erich Fromm)
- The creative adult is the child who has survived (Ursula Le Guin)
- A first-rate soup is more creative than a second-rate painting (Abraham Maslow)
- Creativity is allowing you to make mistakes. Art is knowing which ones to keep (Scott Adams)

## 6. Creativity Research

The description of the creative process can be dated back to the description of the incubation process by the French mathematician Henri Poincaré (1854-1912) while discovering the so-called fuchsia functions. Based on these experiences the psychologist Wallas (1926) formulated a four step creative problem solving process:

- Preparation,
- Incubation,
- Illumination, and
- Verification.

Incubation involves the flashes of insight while in the process of puzzling over a problem or dilemma, mulling it over, fitting the pieces together, trying to figure it out, this the part of the creative process that calls for little or no conscious effort. The flashes of insight come while you are going to sleep, travelling, dreaming, taking a shower, reading a newspaper, relaxing or playing (Eureka experience). Research on creativity started after the Second World War. In the 1950s American psychologists started to investigate the mental origins of creativity and develop creativity tests, the works of Torrance and Guilford started at this time. In Europe, Koestler research work was carried out during the 1950s and his monumental book "The Art of Creation" was published first in 1966. Stenberg (1999) has edited a book presenting an overview of 50 years of research in the creativity field. Now-a-days creativity research work can be classified in the following five domains: the product, the environment, the personality, the process, and learning and cognition, see further Vidal (2004). In this section we will present some areas of special relevance to creative problem solving.

**The creative process**

This research is focusing in the way that creative solutions and products were developed. Wallas' four-stage process has given inspiration to the development of methods to be used by individuals or groups in the creative solving process. Some definitions of creativity are closely related to the process of sensing problems or gaps of information, forming ideas or hypotheses, testing and modifying these assumptions and communicating the results. In this respect creativity is the ability to see a situation in many ways (*divergent thinking*) and continue to question until satisfaction is reached (*convergent thinking*). The creative process can involve tiny creative leaps or giant breakthroughs. Both require that an individual or a group go beyond where they have gone before, embracing the unknown, the mysterious, the change, and the puzzling without fear.

The creative process may be considered as a new way of seeing, a different point of view, an original idea or a new relationship between ideas. It is the way or manner in which a problem is solved. It is the process of bringing something new into being. It is the process of combining previously unrelated ideas or perceiving a new relationship from previously unrelated ideas. Whether solving problems alone or in a group, you really must have a guided process i.e. a plan or a map of the steps to be followed. This is especially so in a group due to the need to align the capabilities of the members in a positive way. This map is usually called the creative problem solving process and under this denotation there exist a huge number of methods, tools and techniques to support the creative process. Some of them will be presented in Chapter 5.

Group creativity has not been researched as much as individual creativity. Leonard and Swap (1999) presents their process for group creativity as five linear steps for discussion, while acknowledging that in practice it would look more like a "plate of spaghetti." The five steps are (1) preparation, (2) innovation opportunity, (3) divergence: generating options, (4) incubation and (5) convergence: selecting options. This process parallels creative problem solving techniques which involve cycling repeatedly through a process of divergent and convergent thinking.

Box 1 presents some suggestions for effective creative group work. Focusing first on group composition, the concept of "*creative abrasion*" is important. Creative abrasion is descriptive of the friction that is caused when a heterogeneous group works together to develop creative ideas. It is usually hypothesised that the relationship between creative abrasion and performance has an inverted-U shape. That is to say, at low or high levels of abrasion the group is less creative while at moderate levels of abrasion performance is maximized. Creative abrasion is caused by the diversity of the team members along dimensions such as individual professional expertise, cultural heritage, dominant thinking styles, etc. To have creative abrasion groups must have diversity along those same dimensions.

The central three steps in the creative process are divergent thinking, incubation, and convergent thinking. These themes will be discussed later in several of the chapters of this book.

Suggestions to optimize group creativity:

- Group creativity is similar regardless of the magnitude of the task
- Creative individuals are not all-important for group creativity
- Motivation is an essential element in creative work
- Start creativity work with a warm-up exercise
- Creativity is a process that can be learned by groups
- Create a safe haven for new thinking: encourage innovative thinking
- Make sure the objectives are clearly formulated: articulate a clear purpose
- The right group composition is important
- Cross-pollinate your brainstorming groups: creativity thrives on diversity
- Group creativity needs a skilled facilitator: to keep the process moving
- Actively support the individuals for engaging in the process
- A creative process needs both divergent and convergent thinking
- Conclude every workshop with an action plan and an evaluation

#### Box 1. Effective group creativity

##### **Learning and cognition**

This research is focusing on the abilities of creative learning, thinking and cognition in relation to problem solving. All these activities are related to the physiology of thinking and therefore to the function of the human brain. Creative learning is a natural, healthy human process that occurs when people become curious or excited about understanding or knowing more. Anytime we are faced with a problem or dilemma with no learned solution, some creativity is required. Creativity, by its very nature, requires both sensitivity and independence. In our culture, sensitivity is a feminine virtue while independence is a masculine virtue. Landrum (1994) outlines some specific differences between male and female approaches to learning:

The *female approach* is based on:

- Negotiations,
- Feelings,
- Understanding,
- Personal relationships,
- Intuition, and
- Win-win outcomes

The *male approach* is based on:

- Aggressiveness,
- Competition,
- Ego gratifying,
- Impersonal relationships,
- Rationality, and
- Win-lose outcomes

In the creative process we use the female approach primarily in the divergent thinking and the male approach in the convergent thinking.

All people learn through their senses: touching, smelling, tasting, feeling, hearing and seeing. According to Matte and Henderson (1995) more than half of the population in the USA are visual learners (they want to read it). The rest of the population are with fifty percent probability either auditory (they want to hear it) or kinaesthetic (they want to experience it). The understanding of different forms of cognition and creativity is related to the structure and function of the brain, a research area known as neuro-psychology that has undergone a huge expansion and that has contributed a lot to the understanding of individual creativity.

The human brain consists of two halves – the left hemisphere and the right hemisphere. Usually the left hemisphere controls the right side of the body and the right hemisphere controls the left side of the body. Each hemisphere has identifiable functions. Communication between these two hemispheres is given by a thick nerve cable called corpus callosum. Sperry (1968) found that both hemispheres use high level thinking skills, though different, both involve thinking, reasoning and complex mental functioning. According to Restak (1991) the right hemisphere is superior to the left when it comes to deal with the novel and unfamiliar, especially when there are no clues or ways to respond. You might say that the right hemisphere is the generalist and creative, with numerous approaches to problems; and the left hemisphere is a specialist and rational, with logical, linear approaches to problems. The boxes below provide a comparison of left and right characteristics Edwards (1979):

<b>Left</b>	<b>Right</b>
Verbal	Non-verbal
Analytic	Synthetic
Symbolic	Concrete
Abstract	Analogical
Temporal	Non-temporal
Rational	Non-rational
Digital	Spatial
Logical	Intuitive

## 7. Group Work

The ability of a group to produce a quality group project is linked directly with the group's ability to negotiate and manage the process of working as a group. Process issues concern how to create the conditions that will enable the group to get the best of each member's skills, capabilities and resources, and how to make the experience of working as a group satisfying, enjoyable and successful.

A successful group does not just happen spontaneously; rather such success is actively developed by its members. The inclusion of group work has three particular aims:



- The first is the quality of learning available through a group effort, especially in terms of the breadth and depth of coverage possible and the variety of perspectives and skills which can be investigated and incorporated toward this,
- The second is that learning group work skills is beneficial to your future work or academic career, where a group rather than individual approach is increasingly preferred, relevant or essential, and
- The third is that by acknowledging the social nature of learning, it can be more enjoyable and meaningful.

Group work has a dual nature, with both process and product objectives. Process objectives concern how the group functions as a group. Process objectives are context based, that is, they are particular to the learning and working environment of a group, rather than as an individual. Process objectives signify the fact that effective group work and group management must be learned. Product objectives relate directly to the specific group task, i.e. the academic learning and the product (essay, poster, presentation, etc) required of the group. Product objectives are content based, that is, they involve the subject matter and the unit's content objectives. Chapter 4 will focus on group work. Group work is a central activity in creative problem solving and collaborative learning in connection with workshops and conferences. This will be seen in all the following chapters of this book.

### **8. Group Facilitation**

To facilitate is “to free from difficulties or obstacles”, “to make easy or easier”, or “to carry out a set of functions or activities before, during and after a meeting to help the group achieve its own objectives”. The facilitator is there to ensure a productive group process whether this is brainstorming a new idea or discussing the latest employee appraisals. The role of the facilitator is to ensure that the group works as a constructive and cohesive unit. This task has three parts: leadership, referee and neutral.

To be effective in the role of a facilitator the person needs to be effective as a manager, requiring several skills and qualities to be able to guide the meeting smoothly. These are: communication, planning, leadership, empathy, education, problem identification, and consulting. In addition the facilitator has to have some personal skills and qualities: flexibility, confidence, authenticity, patience, perseverance, leadership (presence), integrity, initiative, respectability, and perceptive. The art of facilitation will be the theme of Chapter 3.

### **9. Creative Tools**

Several simple tools can be used to support creative problem solving processes. Here three of the most used tools will be shortly presented. In Chapter 5 several other tools will be described and classified.

#### **Brainstorming**

One creative tool, which has been widely used with big success for generating many ideas, is *Brainstorming*. It was invented for the sole purpose of producing checklists of ideas that can be used in developing a solution to a problem (divergent phase). The tool is

directed to generating unconventional ideas by suppressing the common tendency to criticise or reject them summarily. The tool tries to separate idea-evaluation from idea generation because it is believed that if evaluation comes early, it reduces the quantity and quality of the ideas produced. Therefore in a Brainstorming session no criticism is permitted and freewheeling generation of a large number of ideas and their combination and development are encouraged. Brainstorming is founded on the associative premise that the greater the number of associations, the less stereotyped and more creative the ideas of how to solve a problem will be.

According to Torrance (1979), brainstorming skills can be developed when practiced with content or when practiced solely for skill development. It is an excellent technique for strengthening fluency, the imagination and communication skills. It is my experience that brainstorm sessions in groups should always be facilitated.

**Mind mapping**

*Mind Mapping* is a visual and verbal tool used to structure complex situations in a radial and expanding way during the creative problem solving process. A mind map is by definition a creative pattern of related ideas, thoughts, process, objects, etc. It is difficult to identify the origin and the creator of this technique. It is quite probable that this tool has been inspired by research on the interplay between the left and the right hemisphere of the brain.

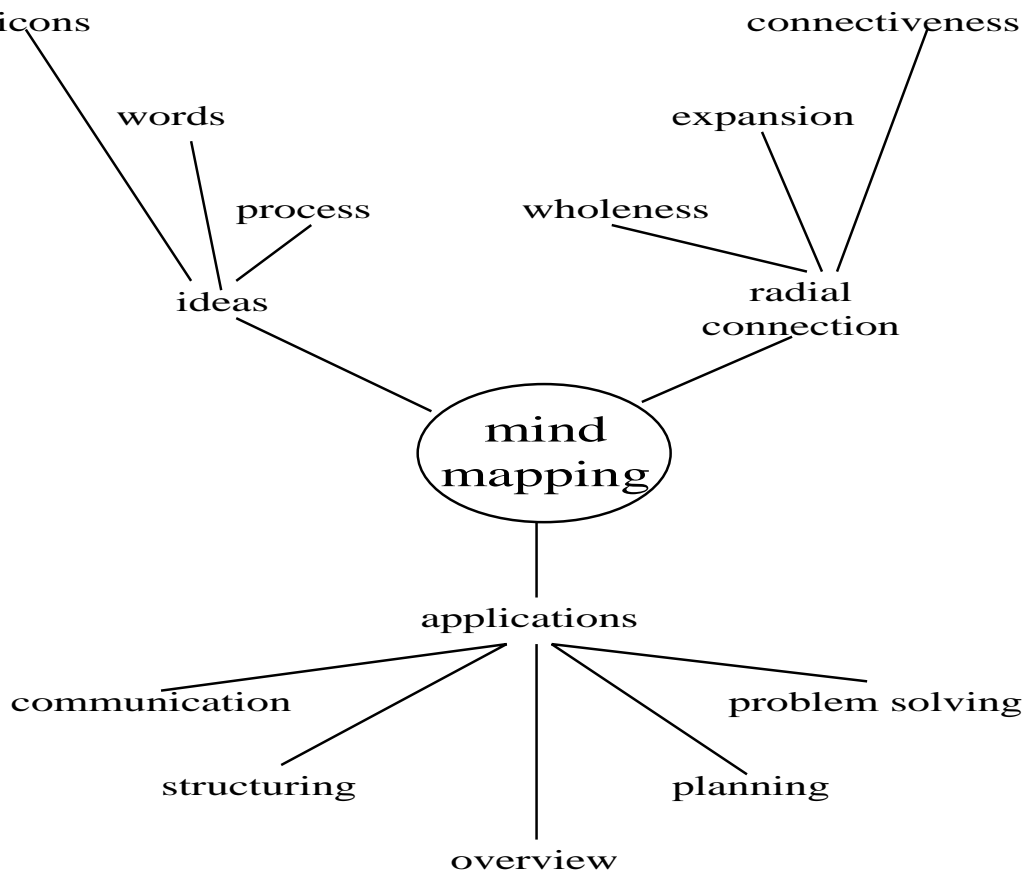


Figure 2. Mind Mapping

Mind maps can be used to structure ideas after a brainstorming session (convergent phase). Pictures, colours, icons and texts can be combined to illustrate ideas in a holistic way. Experienced facilitators are able to combine interactively brainstorming and mind mapping. Mind Mapping is one of the many mapping techniques that are available for problem structuring. It has many applications as shown in Figure 2.

### SWOT Analysis

SWOT Analysis is a powerful evaluation tool for identifying Strengths (S) and Weaknesses (W), and for examining the Opportunities (O) and Threats (T) of organisations, communities, firms, projects, processes, persons, teams, or ideas.

Used in a business context, it helps you carve a sustainable niche in your market. Used in a personal context, it helps you develop your career in a way that takes best advantage of your talents, abilities and opportunities (see Chapter 7). Used in creativity and innovation work, it helps you to structure, identify, and evaluate projects. It is a must tool in the task of developing strategies for organisations and communities. A more complete presentation of this tool can be found in Sørensen and Vidal (1999).

SWOT analysis is a framework for analyzing a company's or project's strengths and weaknesses, and the opportunities and threats it is facing. This will help you to focus on strengths, minimize weaknesses, and take the greatest possible advantage of opportunities available. Table 1 depicts the SWOT matrix and some of the questions that can be answered by a facilitator that wants to improve his performance.

<p><b>Strengths:</b>            What do I do well?            What unique resources can I draw on?            What do others see as my strengths?</p>	<p><b>Weaknesses:</b>            What could I improve?            Where do I have fewer resources than others?            What are others likely to see as weaknesses?</p>
<p><b>Opportunities:</b>            What good opportunities are open to me?            What trends could I take advantage of?            Looking at my strengths, how can I turn these into opportunities?</p>	<p><b>Threats:</b>            What trends could harm me?            What are my competitors doing?            Looking at my weaknesses, what threats do these expose me to?</p>

Table 1. SWOT matrix for the facilitator

## 10. Creative Methods

Creative methods are approaches, procedures and tools that are designed to support the creative work of groups. In Chapter 2, The Vision Conference will be presented. This is a one-day event, workshop or conference designed for a large group of participants, supported by a group of facilitators with the purpose of creating ideas and visions for the future of an organisation, about specific themes.

In Chapter 6, the Future Workshop will be presented. This workshop is primarily used by local groups to deal with community problems and find alternative solutions to the one proposed by the establishment. Other workshops and Conferences will be presented in Chapter 2. The criteria for the selection of these methods have been their usability in creative group work, their facility to be incorporated in facilitated problem solving, and their document usability.

### 11. Barriers to Creativity

To be creative you have to be open to all alternatives. This open mindedness is not always possible to meet because all humans build up blocks or mental locks in the maturation and socialisation process. Some of those locks can have external causes, such as family environment, the educational system, and organisational bureaucracy. Other blocks are internally generated by our reactions to external factors or by physical factors. A key to improve your creativity is to become aware of your locks and do something about them. While everyone has blocks to creativity, blocks vary in quantity and intensity from person to person. Most of us are not aware of our conceptual blocks. Awareness not only permits us to know our strengths and weakness better but also gives the needed motivation and knowledge to break down these blocks. Adams (1986) identifies the mental locks as perceptual, emotional, cultural, environmental, and intellectual. These are shown in the box below.

*Perceptual* locks are obstacles that restraint us from clearly perceiving either the problem itself or the information needed to register the problem. It is well known that our eyes can deceive us in observing some figures. Our perceptions are not always accurate.

*Emotional* locks restrict our freedom to investigate and manipulate ideas. They prevent communicating our ideas to others. These locks are also called psychological barriers and are the most significant and prevalent blocks that impede innovation. Fear of something new is a common characteristic of many individuals in the developed world.

*Cultural* locks are adapted by exposure to a given set of cultural patterns. The culture of the industrialised countries trains mental playfulness, fantasy and reflectiveness out of people by placing stress on the value of efficiency, effectivity and moneymaking. Taboos and myths are predominant blocks to creative behaviour. Therefore, it needs courage to be creative in a culture that does not support creative changes.

*Environmental* locks are imposed by our near social and physical environment. Creative persons have usually had a childhood where they were free to develop their own potentialities.

*Intellectual* locks are caused by conservatism and lack of willingness to use new approaches. The same approaches, the same tools and the same persons are tackling the same problems for years. Persons with intellectual locks are usually very negative to changes and are fast to criticise new proposals.

Finally, in Chapter 8, a guideline to enhance individual and group creative abilities will be presented

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