Dealing with Problematic Situations

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Abstract

The main purpose of this paper is to outline a holistic answer to the following question: How to deal with problematic situations? A framework of a modern approach, a new meta-discipline, based on knowledge and experience from several other disciplines will be presented. We are focusing in those social interventions where the participation of both the user or clients and the facilitators or advisers is required. In these experiences group work are social processes of central importance. In addition, the art of facilitation will also be discussed. Moreover, different problem solving approaches, methods and techniques will be presented. The paper ends with a selective list of references to different disciplines that has given background to the many concepts and approaches presented in this paper.

Keywords

Messes, Problem Solving, Facilitation, Rationality, Creativity, Critique

1. Introduction

In many professions the point of departure is a mess or a problematic situation. A mess is usually defined as a confused, dirty, or offensive condition, or as a disordered situation resulting from misunderstanding, blundering, or misconception. Along these lines we could define a professional as a problem solver within a specific field. Managers, system scientists, computer scientists, operational researchers, system workers, designers, architects, engineers, innovators, medical doctors, lawyers, social workers, action researchers, educators, artists, etc., are primarily dealing with messes in their professional praxes.

Most of these disciplines have developed concepts, approaches, methods and tools to deal with complex problems but there are usually presented in very specific terms related to their specific context. I am quite certain that much of these knowledge and experience have a more general applicability to other fields and that there is a lot to gain by discussing problem solving in more general terms. In other words, this paper can be considered as an essay to create a new discipline: **The art and science of problem solving.** In this new field rational, critical and intuitive approaches as well as their interplay, will be emphasised when dealing with problematic situations. Moreover, knowledge and experience coming from both theory (the facilitators or experts) and practice (the users or clients), as well as their interplay based in real-life problem solving, will be central in this field enhancing participation and dialogue. The final validity of our problem solving approaches will be their usability, what works in the real world is valid.

The main purpose of this paper is to give a holistic view to the different elements in modern problem solving based on some concepts of system thinking and multi-disciplinary principles. Modern frameworks, concepts, approaches, methods and tools will be introduced in an interdisciplinary manner.

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 Sec.2. What is central in this framework is the focusing in 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 Sec. 3.

The real problem with messes is that at the beginning you do not know what is the problem to be solved. Complex problematic situations are usually composed of a network of interrelated problems, therefore the first task is to move from messes to problems, this stage is known as problem identification, problem structuring or diagnosis. Some ideas and principles that can support this complex process are presented in Sec. 4.

In our framework a central element for problem solving is group work done in behalf of the clients or users, therefore Sec. 5 is devoted to the conditions for creating synergetic effects in group work and collaborative problem solving. Group work often demands some kind of support to accomplish its task, this support is usually provided by a facilitator in the form of: design of the social intervention, management of the problem solving process, providing some expert knowledge, and enhancing the learning aspects of the intervention. Facilitation of work groups in a problem solving process is the subject of Sec. 6.

Sec. 7 gives an overview of different approaches, methods and tools that have been used to steer and support the problem solving process. Rational approaches both in a hard and soft versions are presented. In addition, creative and critical approaches are also discussed.

Evaluation, Systematisation and Social Research are different and complementary form of social interventions that can be carried out after dealing with a problematic situation. These ideas will be shortly outlined in Sec. 8.

Finally, the last section provides an overview and references to the different disciplines that have given concepts, principles, approaches, methods and tools to these new meta-discipline that we have called the art and science of problem solving.

2. The Scene
The point of departure in our discussions is the concept of an *organisation*. An organisation can be a family, a community, a corporation, or an 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 are conditioned by external and internal

factors, and sometimes organisations are experiencing *problematic situations or messes,* that is 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 actions plan. 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. The situation is also problematic because the organisation has neither the technological background to identify different technological alternatives nor the experience for dealing with problematic situations. Management (the decision- makers) has appointed a work group (one person) to deal with this mess. 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.

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.

To deal with messes, it is recommendable for the work group to hire *a facilitator*. A facilitator will support the group in the *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 facilitators as a professional has some technical expertise, for
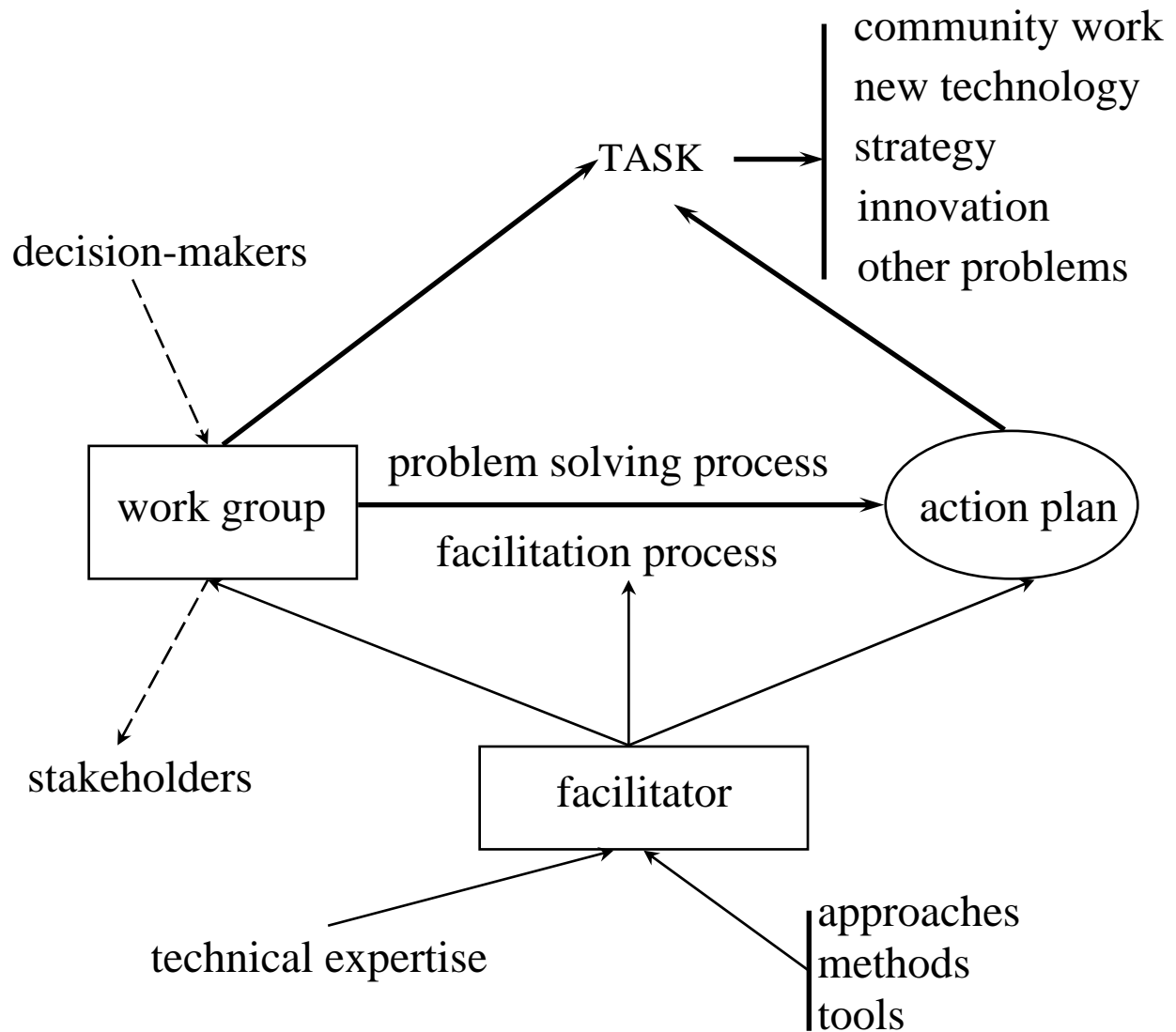
Figure 1. A framework for participative problem solving

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 finds suitable for the given situation. The approaches could be quantitative (hard), qualitative (soft), participative (critical), innovative (creative) or a combination of them (multi-methodology). To facilitate groups demand the ability to both design and mange problem solving processes, creating a pro-active atmosphere and synergetic effects. Fig. 1 summarises all the elements and concepts discussed above that will be further elaborated in the rest of this paper.

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 paper to support in the organisation and facilitation of a one-day 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 work groups, a tool that will be used during the implementation process of the LEADER+ program.

The facilitator designed and managed the Vision Conference where several creative techniques were used. The final result was a long list of potential projects. This will be used in the debates of the DOC's board while allocating funds to some selected projects. This case study has been reported in Vidal (2002).

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.

The second example illustrates what is known as a **user-driven intervention**. The work group was composed of professionals covering different disciplines and with a lot of 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 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 Management 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 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: Public planning
It is my experience that my students start a social intervention as a research-driven form to be used as a case study for their thesis work. Later, some of these studies evolve to a participative intervention seeking to develop and to implement the results achieved in the first intervention. This is for instance the case study reported in Pilegaard and Vidal (1995), the implementation of a computerised system at The Ministry of Education in Denmark to plan the annual examinations at all the high schools of the country. This is a large-scale logistic and scheduling problem. The problem was solved using a whole system of hard methods developed by computer engineers under the facilitation of a systems analyst in close cooperation with a group of planners from the ministry. The last seven years this system has been used in real-life.

4. From Messes to Problems
A problematic situation or mess can be characterised as follows:
- Highly complex situation, due to many factors, many actors, lack of structure, many interrelated objective and subjective aspects, etc.
- Lack of internal transparency, due to many uncertainties about the reactions of the actors, many interrelated communication channels, and internal power relationships.
- Several conflicting goals, due to the lack of agreement about the visions and mission of the organisation.
- A whole network of interrelated problems of change in the organisation.
- Dynamic situation, due to a permanent interplay between the organisation and the environment.
- Lack of technological and methodological expertise in the organisation.
- To deal with them demands a close interplay between practical knowledge of the work group and the expertise of the facilitator.

In the area of Planning, messes have sometimes been characterised as wicked problems as those having the following properties:
- Cannot be easily defined so that all actors agree on the problem to be solved.
- Require complex judgements about the level of abstraction at which to define the problem.
- Have not clear stopping rules.
- Have better or worse solutions, never right and wrong ones.
- Have no objective measures of success.
- Require iteration, every trial counts significantly.
- Have not given alternative solutions, these must be discovered.
- Have strong ethical, political and professional dimensions.

Sometimes, wicked problems will be called ill-defined problems to enhance the fact that from the beginning we do not know what the problem is, then the situation has first to be structured to identify the interrelations of several sub-problems.

Many problematic situations are related to the need of some changes in the organisation or/and its environment. In such situations, it is a good idea to develop a **strategy** to be able to cope with the changes that the future brings about. Strategy development usually involves explicit formulation or formation of goals and visions for the future state of the organisation in question. It has been identified six strategies or models for change:

- **Escaping**: Leaving or shutting down the organisation might be a manner to cope with a problematic situation. This is not an unusual strategy in the business world, where companies shut down to get rid of economic problems.
- **Reacting**: It means to do nothing in advance adopting a wait-and-see attitude, any action will essay to avoid pain and pursue pleasure as much as possible. State institutions and public organisations usually use this strategy.
- **Rational-thinking**: Here the idea is to establish options for decision-making and then to choose the best according to pre-set standards. This strategy can be efficient for simple decisions, but often fail to account for the real needs of people or generate real commitment to decisions. This strategy will be used when getting professional advice from rational experts: lawyers, engineers, IT specialists, economists, etc. This is analytical and machine age thinking.
- **Critical-thinking**: In this case one seeks to understand the underlying causes to the problematic situation and to determine high leverage solutions. This strategy assumes a system model of change, where we recognise that the apparent problem may just be a symptom of some deeper issue, and we seek to understand what is really happening. Professionals practising Systems Thinking (Midgley, 2000), that is holistic approaches, breaking traditional boundaries and enhancing interdisciplinarity, use this strategy. This is systems age thinking.
- **Intuitive-thinking**: Here one uses the unconscious, creative mind to envision a desired future and to bring this future into being. The facilitator can use creative techniques to create visions of the future and creative problem solving approaches to deal with the mess. This is creative age thinking.
- **Transformational-thinking**: This is important when big issues are addressed creatively, with open minds and hearts. Win/win breakthroughs are the natural result as well as the spirit of community. Here critical and intuitive-thinking will be combined with empowerment of the group and the spirit of self-organisation to contribute to the development of a community of practice. This is radical thinking.

For the sake of concreteness, let us see some examples of problematic situations. As we saw in the previous section, problematic situations usually arise in connection with the introduction of new technologies in the organisation, more specifically information technologies, because there is not a unique option. In addition, these technologies will usually cause radical changes in working procedures, communication channels, and the organisation itself, therefore the need to elaborate a strategy and an action plan. Similar situations are experienced by primary schools while adopting information technology for their education activities. Another example can be found related to the development of a community, where many actors and projects are interrelated creating many conflicts about goals and actions. In such situations it is advisable to organise a conference or workshop to create visions about

the future, thereafter to elaborate strategies and action plans to reach the selected visions of the future, see further Vidal (2002), Jungk and Müller (1987). Messes can be found in other areas of industry as design and innovation, management, planning, control and communication, marketing, project management, policy analysis, staffing, motivation, environment planning, and advertising. At the national level many ministries are confronted with many messes related to technology, energy and environment, employment, health, education, social problems, etc.

To deal with problematic situations, it is advisable to use the following principles coming from the area of Systems Thinking:

- **Problem structuring**: Structure the situation from a holistic and systemic viewpoint trying to identify the network of interrelated problems; the interrelations are usually more important than the single problems therefore the bad performance of decomposition approaches.
- **Dialogue and participation**: Between the stakeholders, the work group and the facilitator during the process of problem structuring and problem solving, interplaying practical and theoretical/methodological knowledge and experiences.
- **Focusing**: Identify and formulate the problem to be focused on by specifying *the boundary* of the problem, boundaries are social or personal constructs that define the limits of the knowledge that is to be pertinent in an analysis.
- **Expanding**: Expand or break the boundaries, then reformulate the problem and analyse the changes in what concerns stakeholders, information and methods to be used.
- **Problem solving**: Developing a designed approach that can be supported by a facilitated process using a set of suitable approaches, methods and tools.

An aspect of extreme importance related to the identification and solution of a problem is the necessity of being sure that we are solving the right problem. Mitroff (1998) has suggested the following five facilitation strategies for avoiding solving the wrong problem precisely:

- **Select the right stakeholders if you can**: Never assume that others will regard a situation as you do; look for multiplicity of views; never underestimate people; the best educated are seldom the most creative; never contribute to the increase of tensions/conflicts inherent in a situation; listen to the participants actively and sincerely and support them.
- **Expand the options**: Never accept a single definition of a problem; present at least two different problem formulations, better three; expand the problem within, across or between; break boundaries; problems can be formulated out of different perspectives: scientific, social, existential or systemic.
- **Phrase the problem correctly**: Examine carefully every formulation of a problem for the implicit assumptions; always essay to produce at least one formulation in technical terms and another in human terms; always see the problem from top to down and from down to top; be dialectical identifying contradictions.
- **Expand the problem's boundaries**: Never define the boundaries of an important problem too narrowly; never define the boundaries just for the managers, other stakeholders might be rather central; Actions have to be adopted by the whole organisation and supported by management.

- **Be systemic**: Never attempt to solve an important problem by decomposing it into isolated and tiny parts; Identify and analyse the broader system in which the problem is situated; Usually, the interactions between important problems are more important than the isolated problems.

5. Group Work and Collaborative Problem Solving

Working with a group on a problem-solving project can be a pleasure and a rewarding experience, especially if synergetic effects have been created. Working with a group can also be a frustrating and a time wasting experience. Experience shows that the product of a well functioning group work has better odds for success than does the product of single individuals. In modern life most individuals spent time working in cooperation and collaboration with others. Group decisions have demonstrated to be generally superior to individual decisions due to four main reasons:
- Members of groups can offer complementary and supplementary information, experiences, perspectives, and opinions, making the pooled knowledge greater than the sum of its parts.
- For many persons, the simple presence of others even without interaction spurs them on to think harder and more creatively.
- Within groups, the most confident, conscientious, and creative members tend to prevail.
- Errors made by the group are more likely to be detected by a group member than individual errors are to be detected by an individual.

Good group work demands a balance between building a sense of solidarity and responsibility among members during the problem solving process, and getting the task accomplished. This demands from the members of the group not only intelligence and creativity but also social skills. People are not born with social skills; they have to learn them. The way to learn them, obviously, is by working in groups (learning by doing).

Most groups go through four phases in the problem solving process (Tuckerman, 1965):
- **Forming**: During the initial stage of the group, structure is developed, roles are assigned or claimed, status relations between the members of the group are established, norms begin to emerge, shared values are discovered, and general procedures for decision making and problem solving are agreed upon.
- **Storming**: Conflicts in values, perspectives, goals, power, and information are discovered and fore grounded, and progress toward resolution is begun. This is often a creative stage and should not be avoided.
- **Norming**: As conflicts are discovered and resolved, the group's approach to communication and problem solving is more firmly established.
- **Performing**: Having established roles, personalities, and norms, the group's time, attention, and energy is increasingly directed at the group task and decreasingly concerned with group maintenance, procedural questions, or personalities.

These phases are not to be moved through as rapidly as possible. Problems in performing may often be traced back to insufficient storming and norming, for instance. Group discussion, while storming out some controversies, may return to issues involved in forming, redistributing responsibilities, rediscovering common

values, and modifying procedures. Analogously, a group having difficulty in performing may either implicitly or explicitly, need to redefine some norms. These phases do not need to be followed linearly, these phases are considerable more fluid and interactive, as well as less deterministic, with groups moving freely between stages. Mc Fadzean (1998) suggests that groups need to develop through different stages if they are to become high-performing teams. Most groups never reach such levels because the task does not require them to be revealing and open. But messes often require highly innovative solutions demanding a high-performance from the group.

Aside from the formal roles of coordinator and recorder, most groups need and find people to play a number of other group maintenance roles essential to the health and the progress of the group, some of the helpful roles for the group are: encouragers, feeling expressers, harmonisers, group observer and commentator, compromisers, standard setter, and gatekeepers and expediter.

Some group members may select, consciously or not, to play roles that are unhelpful to the group. Some of these are: freeloaders, withdrawers, aggressors, dominators, help seeker, self-confessors, blockers, and status and recognition seekers. The common aspect among these roles is a conflict between personal goals and group interest.

In addition to group maintenance roles, which are essential in keeping the group unified and efficient, every member will have to play several task roles, some of these are: Initiators, information seekers, information givers, opinion seekers, opinion givers, clarifiers, elaborators, orienters, evaluators, energisers and summarisers.

An individual's personality affects how a person sees problematic situations and problems and goes about dealing with them. If a group consists mainly of people with a single personality type, problematic situations will be seen in only one way providing fertile ground for solving wrong problems. Therefore it is very important to have different personality types in the group to challenge one another's perspectives. Moreover, some personality types are better for adopting the different roles we have mentioned above.

C. G. Jung (1921) developed the theory that individuals each had a psychological type. He argued that there were two basic kinds of functions which humans used in their lives: How we take in information and how we make decisions. He believed that within these two categories, there were two opposite ways of functioning. We can **take information** via: our senses or our intuition. We can **make decisions** based on: objective logic or subjective feelings. We all use these four functions in our lives, but it is possible to identify an order of preference for these functions within individuals. The function, which someone uses most often, is the dominant function; the dominant function is supported by an auxiliary function, tertiary function, and inferior function. Jung asserted that individuals either extraverted or introverted (**flow of energy**) their dominant function. The dominant function is so important, that it overshadows all the other functions in determining personality type. Later, a fourth dimension has been added, which is concerned with how we deal with the external world on a **day-to-day basis**: Judging or perceiving. The combination of our four preferences defines our

personality type. Let us elaborate a little more about these four preferences (Golberg, 1983).

The **Sensing** or **Intuition** preference refers to how we obtain information. We all need data on which to found our decisions. We obtain data through our five senses. There are two distinct ways of perceiving the data we gather. The sensing preference absorbs data in a literal and concrete fashion. The intuitive preference generates abstract possibilities from information that is gathered. We all use these two preferences, but to different degrees of effectiveness and with different levels of comfort. We are sensing when we: taste food; notice a stoplight that changes; memorise a poem; follows stages in a plan; etc. We are intuitive when we: come up with a new idea; evaluate the consequences of current decisions; register underlying meaning in what people say or do; see the big picture; etc.

The **Thinking** or **Feeling** preference refers to how we make decisions. When we make a decision that is based on logic and reason, they are operating in thinking mode. When we make a decision founded in our value system, or what be consider being right, we are operating in feeling mode. We are making decisions in the thinking mode when we: research a product via consumer reports and select the best one; do the right thing, whether or not we like it; always make a plan, etc. We are making decisions in the feeling mode when we: buy something because we like it; avoid upsetting people; say no to a job because we do not like the work environment; move to be close to someone we care about; etc.

When we talk about **Extraversion** or **Introversion** preferences, we are separating the two worlds in which all us live. There is a world inside us, and a world outside of our self. When we are dealing with the outside world we are extraverting. When we are inside our own minds, we are introverting. We are extraverting when we: talk to other people; listen to what someone is saying; cook dinner; work on a car; etc. We are introverting when we: read a book; think about what we want to do or say; are conscious of how we feel; think about a problem so that we understand it; etc.

Judging or **Perceiving** preferences refers to our attitude towards the external world, and how we live our lives on a day-to-day basis. Individuals with the judging preference want things to be neat, orderly and established. People with the perceiving preference want things to be flexible and spontaneous. Judgers want things settled, perceivers want things open-ended.

Putting the various combinations together results in sixteen different personality types, this means that in both theory and in reality, there are at least sixteen different ways of looking at and analysing any problematic situation. From a practical viewpoint, sixteen views are difficult to handle, it is easier to operate with those four more common personality types: Sensing-Thinking (STs), Intuitive-Thinking (ITs), Intuitive-Feeling (IFs), and Sensing-Feeling (SFs).

STs focus on technical problems, precisely defined in terms of conventional knowledge and technology. They are reductionists; decomposition is their main method. They prefer symmetry, order and control.

ITs also define problems in technical terms, but focusing in future technology and take broad systems as a whole into consideration, they use a holistic and systemic approach. They think outside the box, breaking symmetries.

IFs also think in terms of large whole systems; but instead of technology and knowledge, they focus on people and humanity. They concerned with broad issues related to equity, fairness, ethics and justice. They express a disdain to traditional structures and habits that cramp and inhibit feeling.

SFs also are reductionists, except that their units are human, not technical. They believe that only individuals and families matter.

If a group has enough diversity in its members, then it can generally produce four different definitions of a problem, reflecting the four basic personality types. If a group is not able to examine a problematic situation, at least from these four perspectives, then this inability is one of its most basic problems.

Another important aspect in group work is related to how the individuals communicate to each other. We need to recognise two ways of communication: transactional and transformational. Transactional communication is a plain transmission of information between sender and receiver. Transformational communication, on the other hand, is a heart-to-heart experience where individuals and ideas evolve together. Let us elaborate a little more on these concepts especially in what concerns problem solving and group work.

Transactional communication is focusing in the content: **What** is said. Information is transmitted: concepts and information are exchanged, modified or evaluated. People remain the same although they improve their skills or have new understandings. Individuals remain detached from the problem they talk about and the people they talk with. The process can be programmed step by step, as with an agenda. The results (knowledge, skills, decisions, etc.) are measurable. Associated concepts are: discussion, input, training, team, compromise, agreement, and decision-making.

Transformational communication is focusing in the process: **How** is said. New information is created: concepts, information, and individuals all evolve together. People are moved by the experience, and become different in a meaningful way. Individuals are fully involved, building trust and a collectivistic sense. The process is highly dynamic: people go with the flow. Measurable results are often greater than transactional results. Associated concepts are: dialogue, involvement, learning, community, consensus, and choice-creating.

Most group work is aimed at decision-making rather than choice-creating. In decision-making work style agendas are prepared, goals are defined, and stepwise methods keep people on track. However, by structuring this form of communication, thinking is narrowed, the potentialities of people are diminished and the possibilities for change limited. Choice-creating is when people confront an issue they care about seriously in a manner that allows them to be: Authentic, open-minded, openhearted, learning, engaged, respectful, creative, and efficient.

6. Facilitation

Depending on the problematic situation on hand and the way in which it is approached or which strategy for change is used, the work group often needs some kind of support to accomplish its task. Obviously, the demands for support will increase when moving from a rational-thinking strategy to a critical-thinking one. Supporting a transformational-thinking strategy demands the highest form of support.

In general, support will be given within one or more of the following three areas:
- The management of both the group process and the problem solving process,
- The acquisition of knowledge and expertise from different disciplines (Engineering, IT and Computer Sciences, Environmental Sciences, Organisation Development, Social Sciences, etc.), and
- Learning how to deal with problematic situations (empowerment and self-organising).

An external person, the so-called facilitator especially hired to this job, will usually provide this support. In experienced work groups one of the members of the group will be appointed as the facilitator. In most of the literature and textbooks, facilitation is usually restricted to the management of social processes, to facilitate means to make it easier for the work group to address important issues creatively, co-operatively and collaboratively. In practice, the selected facilitator will also have professional knowledge and expertise of relevance for the group work and he or she will also be a teacher. A good facilitator should be able to give support within all the above-mentioned areas when needed. In the first example mentioned in Section 2, the facilitator is finishing his studies in informatics and engineering, while in the second example; the facilitator is a university teacher with experience in community work. In the third example, the facilitator is an expert in the design of computerised systems using mathematical models.

In connection with the group work, there are two central social processes to be managed: the problem solving process and the group process. The first process is how the work group essays to solve the task of generating ideas and visions of how the problem could be solved. The second process is related to the manner how the individuals in the group work together, how they learn, how they communicate, their social and power relationships, and how they deal with conflicts, etc. Obviously, these two processes interact each other in various degrees; the ideal group work is the one where these two processes support each other. We talk about **group dynamics**, when energy and synergetic effects are created in the group work as a result of well-balanced processes where the task is just as important as the group's trust and identity.

In praxis, there is a third social process: the facilitation process. The facilitator is the manager of the other two processes and his main mission is to create and support group dynamics. By focusing and guiding group members' communication and decision-making processes in a structured form, the facilitator can reduce the chances of engaging in faulty processes and harness the strengths of the group. This can be achieved using the following guidelines (Heron, 1999):
- Use approaches, for example creative, visual and mapping techniques, to co-ordinate members' thinking.
- Specify a set of objective ground rules for the group work.

- Build up on the strengths of the group and protect the group against its weakness.
- Balance members' participation.
- Support the group while dealing with conflicts.
- Plan time to close the different social processes.
- Make the group to reflect and evaluate the group dynamics.
- Empower the group.

The facilitator is constantly thinking (reflection) and (actively) listening the deliberations in the group work in order to make suitable interventions (decision making). Interventions mean communicating with the group, given information and knowledge, and encouraging the participants to think about important topics. The facilitator should possess the following competences: Able to create empathy, being specific and concrete, being genuine, able to create respect, effective listening and hearing, and able to communicate non-verbally.

It should now be clear that the facilitator could play a crucial role in working groups. By understanding the social processes, the facilitator can intervene to support the group to maintain a problem solving orientation to its work. Understanding is based on emphatic observation of both verbal and non-verbal behaviour. The facilitator has to observe participants' roles, the manner how the members of the group communicate, and the emotional life of the group. The facilitator should be able to make inferences about issues that are not being addressed directly; this can be achieved by being attentive to overt and symbolic content, and by considering what is not said in the group. The facilitator should be sensitive to group climate and aware of his or her own feelings and reactions with the purpose of adopting an impartial role. The facilitator should support the group to focus on the task, avoiding distractions and the use of energy in unnecessary issues.

Let us elaborate now more theoretically about the essence of the facilitation process as opposed to its existence or its accidental qualities or in other words the attributes by means of which facilitation as management can be qualified or identified. As we have seen, facilitation is a purposeful process carried out by one or several persons that goes forward between two interacting processes. First, the logical/rational process carried out by a purposeful group (the problem solving group) that wants to achieve some goals. This process has been denominated as the problem solving process; this is the scene of objectivity. Secondly, the intuitive/irrational process that refers to the chaotic social process provoked by each single participant, by the participants relations to each other, or by the participants relations to the facilitator of the purposeful group, these bring into the participants own subjectivity, intuition, fantasy and feelings. This process can be denominated as the problem destruction process, this is the scene of subjectivity.

The facilitation process will move in the grey zone between the scene of objectivity and the scene of subjectivity. The rational and the irrational processes are fighting one to another; the one wants to impose over the other. They are in conflict to each other, but they need each other because while the problem solving process seeks to achieve realistic solutions, the irrational process will be the basis for the production of new ideas. Rationality needs chaos, and chaos needs rationality. Due to this contradiction, rationality versus chaos, we can stipulate that facilitation is a **dialectical** process.

Let us also emphasise that facilitation is a purposeful intervention in a social process, a designed process. Facilitation is not a necessity for the evolution of the problem solving process but it is designed to support the problem solving process. The facilitation evolves very dynamically in a grey zone essaying to construct a bridge between the traditional/conservative problem solving (business as usual) and the new/revolutionary power to change. The purpose of facilitation is to seek that the two above-mentioned processes do not destroy each other, but on the contrary support each other. In this way, traditional problem solving develops to creative problem solving. This dialectical conceptualisation of group creativity is a generalisation of a neuro-psychological model of the brain's function while thinking creatively; see further Damasio (1995).

The facilitation process can be managed in different manners, as there are several management styles. The facilitators are the managers of this process. Note that if the group can manage itself, there is no need of a facilitator. That is the group can learn to facilitate itself. As in any management process, it is a good idea to develop a strategy and design an action plan for the facilitation process and the whole problem solving process.

Management also involves three other central factors: Power, communication and learning. These aspects are always present in any facilitation process and should be reflected and articulated before, during and after the intervention. Facilitation becomes **an art** when a synergetic effect is achieved due to the constructive interaction between the rational and the irrational processes. The facilitator then becomes the director of a performance, where each participant plays a central role. By the end of the performance if synergy has been created all the participants will explode in a rush of happiness and pleasure, the pleasure of working creatively and collectively to achieve some goals. It is the same feeling that football players experience after a match where the victory has been the result of a combination of individual creativity, collective hard work and suitable facilitation (the coaching).

Summarising, we can state that the purpose of facilitation as management is not only to solve the task, but other additional goals could be:
- Each participant is a potential facilitator, therefore the importance of the learning dimension;
- Empowerment and self-organising, the participants learn to be more self-confident and learn to work creatively in a group (creativity is an act of liberation from the jail of our own routines); and
- Praxis, the facilitators should be able to learn from the experience therefore the importance of the evaluation of the processes and the systematisation of praxis, see further Sec. 8. In addition learning from failure is a good principle for any facilitator.

Recently, J. Rough (2002) has introduced the concept of **dynamic facilitation**. He asserts that rather than seeking to manage change, the facilitator should elicit, sustain, and enhance the self-organising dynamic of change. The dynamic facilitator works more completely with self-organising change than the traditional facilitator.

The dynamic facilitator supports people make progress in jumps, creative insights, and spontaneous changes of heart, in few words, the dynamic facilitator supports

people to do transformational changes using some of the following principles: Assures choice-creating rather than decision-making, supports people attend to the problem, supports the group assume ownership of the problem, listen and reflects actively, supports the structuring of the conversations, protect people from all forms of judgement, go with the flow, supports divergent and convergent processes, supports group creativity, creates a positive atmosphere, and summarises progress.

Obviously, the type of mess the organisation is confronting, the experience and maturity of the work group, and the adopted strategy for change, will set the boundaries for the type of facilitation to be carried out.

7. Problem Solving Approaches

The facilitator will use some approaches, methods and techniques to support the problem solving process. These will be selected according to the type of problematic situation on hand, the background and experiences of the clients, and the practical experience of the facilitator. Approaches specify general principles and a step-wise process for problem solving. The most utilised approaches are: the rational, the creative, and the critical. Rational approaches give advice of how to deal with problems within the boundaries of the system in question. To be rational is to be intelligent problem solver. Creative approaches focus on breaking the boundaries of the system in study. To be creative is to be innovative problem solver. Critical approaches are used in conflictive situations where the goal is to empower the users. To be critical is to be radical problem solver. These approaches do not exclude each other. Critical approaches usually combine both rational and creative approaches. In each family of approaches a series of methods will be found. Methods usually give very specific guidelines to the problem solving process. Techniques are simple and practical tools that can be used in any approach or combined with methods.

Rational Approaches

The main principles behind rational thinking are logical coherence, decomposition and optimisation; these principles will guide the structuring of the problematic situation. A problematic situation can be rationally structured using a hard method, a soft method or a combination of both methods.

A typical rational method is **PrOACT** (Hammond et al, 1999), a decision-making process composed of eight steps taken one step at a time:
- **Pr**oblem: What is the decision problem?
- **O**bjectives: What are the fundamental objectives?
- **A**lternatives: What are my options?
- **C**onsequences: What are the consequences of each option in terms of the achievement of each of my objectives?
- **T**radeoffs: What are the tradeoffs among my important objectives?
- Uncertainty
- Risk Tolerance
- Linked Decisions

The first five steps constitute the core of the method, therefore the acronym that serves as a reminder of a proactive attitude to change. The three remaining elements help clarify decisions in volatile or evolving environments. The essence of this method is to divide and conquer. To resolve a problematic situation, you break it into

these elements and think systematically about each one, focusing on those that are key to your particular situation. The facilitator will be an expert using this method and in the context where it is used: engineering, finance, economics, etc. The users will not participate directly in the problem solving process and objective facts will be the main focus. It is in this sense, that these are called **hard methods.** In addition, the problem solving process is usually focusing in the construction of a mathematical model to be optimised. The emphasis in quantification and mathematical modelling makes this method even harder. Many of the simulation and optimisation methods in the discipline of Operational Research, Economics, Industrial Engineering, etc., are hard methods. The most used and mis-used mathematical model in problem solving is the so-called Linear Programming model, where the objective is a linear function to be optimised subject to a set of linear constraints. The model will be provided with the needed parameters and an algorithm will produce an optimal solution. A rather complete list of mathematical models is presented in Daellenbach (1994).

A rational method, usually denominated a **soft method**, is the Design Approach to mess management and planning (Ackoff, 1981). It involves problem solving, as a structured process that has five phases:

- **Formulating the mess**: To capture and outline the essential systemic properties of the mess by projecting the future that the system would have if nothing is done.
- **Ends planning**: To select the visions and goals to be pursued by preparing an idealised redesign of the system in question.
- **Means planning**: Here the ways of filling the gaps between the two first stipulations are selected; they can take the form of policies, programs, projects, practices or individual course of action.
- **Resource planning**: Determine the needed resources in terms of people, equipment, materials, finances, etc.
- **Design of implementation and control**: elaborate an action plan.

These steps of design-oriented problem solving are carried out in a participative manner, where the knowledge and experience of the users are important elements in the problem solving process. In addition qualitative and quantitative elements, as well as objective and subjective aspects are central aspects in the problem solving process. Some central ideas of this soft method are the holistic principle, creation of synergetic effects, participation, facilitation and management of problems. There are some more specific soft methods that have been developed in Operational Research, Management Sciences, etc., such as: SWOT-analysis, Scenario, STRAD, SODA, SSM, etc. (Rosenhead and Mingers, 2001) (Dyson and O`Brien, 1998).

Creative Approaches
Rational problem solving approaches are suitable for well-structured problems but are not very useful when we are facing messes. Creative approaches are what millions of people do to survive every day of their life, yet we get no practice on these skills in our structured, deterministic, safe, and supervised learning environments. Creative problem solving deals with situations where boundaries have to be broken, exploring visions for the future of the organisation.

Already Osborn (1953) described several basic steps to support groups and individuals to be more successful in creative problem solving. Later, based on these

proposals, several researchers have formalised and extended these ideas into a systematic approach to creative problem solving known as the CPS (Creative Problem Solving) model or process. 4-steps, 5-steps and 6-steps models have been proposed. Here we present the most general version. The 6 steps are:

- **Mess finding**: Identify areas of concern. Generate ideas of possible problematic situation from a holistic viewpoint. Identify the three most critical and general problems. Select one for further work.
- **Fact-finding**: Observe carefully, like a video camera, while collecting information and data about the problem situation. Both objective facts and subjective experiences should be collected, explored and identified.
- **Problem finding**: Fly over the challenge or the problem by considering different ways of regarding it. Think about those possibilities.
- **Idea Finding**: Search for a variety of ideas, options, alternatives, paths, approaches, manners, methods and tools. Select potential solutions or ideas.
- **Solution finding**: Dig about the ideas in new and different ways, from other viewpoints and criteria. Assess the consequences, implications, and reactions to the selected ideas. Select ideas and solutions to develop an action plan.
- **Acceptance finding**: Develop ideas about how to implement the action plan. Search for ways of making the ideas or solutions more attractive, acceptable, stronger, more effective, and/or more beneficial. Develop a working plan for implementation.

Considerable research into the CPS process shows that a willingness to consider alternatives, to take some risks, to venture into insecure land, and to tolerate some uncertainty and ambiguity are important; see further Parnes (1997) and Courger (1995).

Experience has shown that it is recommendable at each step of the CPS process to start with a divergent thinking to produce as many ideas or solutions as possible and thereafter to switch to a convergent thinking to select the few most promising ideas. This is usually illustrated in the form of a diamond.

Some of the rules for **divergent thinking** are:
- Imaging, reframe and see issues from different perspectives
- Defer judgement, criticism or negativity kills the divergent process, be open to new experiences
- Quantity breeds quality, to have good ideas you need lots of ideas
- Hitchhiking is permitted, it this way a synergetic effect can be achieved
- Combine and modify ideas, in this way you can create many ideas
- Think in pictures, to create future scenarios you can even essay to simulate potential solutions
- Stretch for ideas, imaging ideas beyond normal limits, and
- Do not be afraid to break paradigms, avoid destructive criticism, and add value to the challenged concept.

Some of the rules of **convergent thinking** are:
- Be systematic, find structure and patterns in the set of produced ideas
- Develop ways to evaluate ideas, assess qualitative and quantitative measures of ideas

- Do not be afraid of using intuition, this is the way how most important decisions are taken
- Avoid quickly ruling out an area of consideration, take your time or better sleep on it
- Avoid idea-killer views, try the impossible, do not be afraid to clash a wall it is not sure that the wall will always hold
- Satisfy, do not expend to much time in looking for the optimal solution of an ill-structured multi-criteria problem
- Use heuristics, use common sense and experience based rules, and
- Do not avoid but assess risk, does not mean being blind to risks, for serious consequences be sure to have a contingency plan.

CPS processes always contain phases of divergent and convergent thinking. Divergent thinking produces as many solutions as possible within the available time. The participants will vary in the way they prefer to produce ideas; some will do it by association others by unrelated stimulus. Convergent thinking on the other hand requires from the participants to use skills in reality testing, judgement and evaluation to choose the one or two best options from a number of possibilities. It is not unusual that in a group some members will very easily diverge, that is build a list of alternatives, while others will converge very fast by trying to select the best solution from the list and the rest will be passive not knowing what is required of them. Therefore the need of a facilitator, he or she designs a clear and visible process to align the group. Usually the facilitator does not select the participants of the group; very fast he or she has to identify the profiles of the participants.

Depending of the size and complexity of the problem the whole CPS process might take long time. During this process the group at some stages will need a facilitator, an expert, or a supervisor to support the different types of decisions to be taken. On the other hand, a very important aspect in this respect is learning. The use of creativity tools and the CPS process can be learned by every person that has a "proactive" stance to life, because of their simplicity many of these tools can be used in everyday life. Children at school and elderly people can creatively empower their life by been proactive instead of reactive. Moreover, being creative in a group is usually fun; creative teams at work usually laugh a lot, see further Goff (1998).

In practice, as a problem solver and /or as a facilitator, you need a very important skill: intuition. Intuition is usually defined as the sixth sense, the power of knowing, or knowledge obtained without recourse to inference or reasoning. It is important to emphasise that intuition is not something contrary to reason but something outside the province of reason. Intuition will help you to deal with what we have called mental locks to creativity, your own locks and how to deal with them and the ability to second guess the locks of others and help them to cope with them, see further Golberg 1983).

Depending on the actual problematic situation some more specialised creative methods could be used combined with creative tools, as for instance: Synectics (Gordon, 1961), TKJ (Kobayashi, 1971), The Search Conference (Emery and Purser, 1996), The Vision Conference (Vidal, 2002), and TRIZ (Kaplan, 1992).

There are many techniques or tools to enhance creative abilities in individuals or groups. The four central abilities are: Fluency, flexibility, originality, and elaboration.

Fluency is the production of multiple problems, ideas, alternatives or solutions. One creativity tool usually used to generate many ideas is Brainstorming.

Flexibility is the ability to process ideas or objects in many ways given the same stimulus. A family of verbal checklists has been developed to enhance flexibility, see for instance the technique known as SCAMPER.

Originality means getting away from the obvious and commonplace or breaking away from routine bound thinking. Picture stimulation is a well-known tool to produce original ideas.

Elaboration is to find patterns and structures after the process of generation of ideas. Mind Mapping is a known visual and verbal tool to structure complex situations.

The above-mentioned tools and many others have been presented in Higgins (1994).

Critical Approaches
Critical approaches are usually both rational and creative. These approaches are related to social interventions where both the users and the facilitator are interested in a participative process to create changes, in other words there is a clear agreement that the intervention has political purposes.

The need of critical approaches is clearly seen in connection to community work, in both rich and poor countries, in people's struggles to survive and develop, at the same time seeking to build-up a real democratic and participative Society.

In principle, any hard, soft or creative method could be used within a critical approach as far as it gives support to the group work. Usually, there is a strong demand of transparency and simplicity while selecting methods and tools.

A typical method used as a critical approach is the so-called Future Workshops developed by Jungk and Müllert (1987). The best topics for future workshops arise out of personal, local or regional concerns, but participants soon come to realise that their problems are linked to more far-reaching conditions nationally and internationally and may often be prompted to pursue these further, not just coming up with criticisms but with constructive suggestions too.

A future workshop is composed of the following phases:
- **Preparatory Phase**: Where the theme of the workshop is formulated and the physical facilities are prepared.
- **Critique Phase**: Where the problematic situation is presented trough a critical process.
- **Fantasy Phase**: Where ideas about how the situation could be change are generated, this is a creative process.
- **Implementation Phase**: Where the results from Phase 2 and Phase 3 are compared with reality and an outline to realise the new ideas is elaborated.

- **Follow-up**: Where the process of implementation is monitored, evaluated and probably new workshops are prepared.

Future workshop can be adapted depending of the context on hand. There are typical three types of workshops: for community work or grass-root initiatives, for pedagogical or educational work, and for management problems. Obviously, several soft methods (SWOT, Scenario, SSM, etc) combined with creative techniques can be used to design a critical approach.

The method known as Critical Systems Heuristics developed by Ulrich (1983) has been used within the area of social planning. This method was developed to provide an "emancipatory" systems research for social planning that responded to the possibility that problem situations might be coercive. He criticises the currently dominant use of the systems idea in System Sciences, which is dominated by limiting mechanistic and organismic analogies, the systems ideas is used only with the technical purpose to help to decide how to do things. His purpose is to develop the systems idea as part of practical purpose, to help us decide what we ought to do. He argues for critical systems heuristics, using each of these three concepts in the sense given to them by Kant as defined below:

- **Critical**: Reflect upon the presuppositions behind the search for knowledge and rational action. Make transparent to yourself and the actors the normative content of designs. All designs must be submitted to critical assessment and discussion and not presented scientistically as the only objective possibility.
- **Systems**: Refer to the totality of the relevant (metaphysical, ethical, political, and ideological) aspects upon which theoretical or practical judgement depend. It is by reference to the whole systems concepts entering into partial presuppositions that critique becomes possible.
- **Heuristics**: Refers to a process of uncovering objectivist deceptions and helping the actors to unfold problems through critical reflection. It is a method by which presuppositions and their inevitable partiality can be kept constantly under review.

Then twelve critically heuristic categories can be formulated from four groups of questions based on the client, decision maker, planner, and witnesses' distinctions. These questions are:

1. Who is the actual **client** on the systems design?
2. What is the actual **purpose** of the systems design?
3. What is its built-in **measure of success**?
4. Who is actually the **decision maker**?
5. What **conditions** of successful planning and implementation of the system are really controlled by the decision maker?
6. What conditions are not controlled by the decision maker (i.e. are in the **environment**)?
7. Who is actually involved as **planner**?
8. Who is involved as **expert**, and of what kind is the expertise?
9. Where do the involved seek the **guarantee** that their planning will be successful?
10. Who among the involved **witnesses** represents the concerns of the affected? Who is or may be affected without being involved?

11. Are the affected given an opportunity to **emancipate** themselves from the experts and to take their fate into their own hands?
12. What **worldview** is actually underlying the design of the system? Is the view of (some of) the involved or of (some of) the affected?

The first three questions are related to the client concern the sources of motivation flowing into the design; they are about its "value basis". The next three questions relating to the decision maker examine sources of control; they are about the design's "basis of power". The further next three questions relating to the planner seek the sources of expertise employed in the design; they concern its "basis of know-how". The last three questions relating to the witnesses reflect on the sources of legitimation considered in the design; they ask for its "basis of legitimation". The power of these questions to reveal the normative content of systems design is best seen if they are put in both an "is" mode and an "ought" mode, and the answers are contrasted.

Flood and Jackson (1991) has develop a method known as Total Systems Intervention, also based in Systems Thinking, that provides a framework to combine different approaches and methods.

8. Evaluation, Systematisation, and Social Research

After a social intervention of any kind there are usually a lot of question related to the vivid experience, learning and evaluation from such a social experience and praxis. Very often, it is difficult to specify the differences and similarities of the activities known as systematisation, evaluation and social research. These three activities are also social interventions and can be carried out in different forms. They are like sisters from the same family. And, all of them contribute to the same goal of knowledge: to learn to know reality with the purpose of transforming it. In addition, all of them are necessary interventions that complement each other.

The evaluation, as well as the systematisation, represents a first level of conceptual interpretation and elaboration of the actual intervention in collaboration with the actors related to the intervention. The purpose of the evaluation is to **measure** the obtained results due to the intervention, confronting it with the initial expectations and the formulated goals. This measurement is both quantitative and qualitative.

The systematisation is the **interpretation** of the social process itself. It is the critical interpretation of the intervention that taking departure from its structuring and reconstruction discovers and explains the logic of the experienced process. It endeavours to discover the central factors that conditioned the process, how they are related to each other, and why it has been carried out in such way.

The evaluation is focusing in the achieved results comparing them with the initial goals and as such it is also a learning activity. The systematisation produces new knowledge that goes deeper than the mere concrete experience (learning by reflecting praxis); it is the objectification of the intervention (from praxis to theory); it structures the disordered knowledge and spread perceptions (from chaos to order); it creates a space for discussion of the subjective interpretations of each participant (collective learning); and it supports the oppressed groups in its endeavour to become more conscious about its situation (empowerment).

Both the evaluation and systematisation are learning activities for both the group and the facilitator, and they should arrive to practical conclusions. Without these two activities, we are missing the most important source of learning: our own experiences. In these sense, both activities are necessary in the learning process, and should be done in parallel.

Both the evaluation and the systematisation can be considered as problematic situations and can be carried out in a participative way using a facilitator and some of the approaches presented before. The systematisation is a more complex task, and an operational approach has been presented in Vidal (2002a).

This first level of conceptualisation obtained by the evaluation and the systematisation, is the basis for a process of theoretical analysis more broad and profound. To move to higher levels, it is necessary to relate the knowledge produced in this particular experience with the accumulated, synthetisised and structured knowledge of existing theories.

The social research is an exercise that generates scientific knowledge that is characterised in a body of theoretical knowledge that explains the contradictions in Society. The social research is a theoretical exercise that permits the understanding of the determinant factors in the social-historical reality. The social research enriches the interpretation of the actual praxis given by the systematisation, with new theoretical elements, permitting a major level of abstraction and generalisation (Reason and Bradbury, 2001).

Obviously, all these three forms of activities should support each other, each of them providing its own contributions, each expressing a different way to learn about reality and each of them necessary in a learning process.

9. Final Remarks
This paper is a first essay to develop a new field that I have called the science and art of problem solving. This is a holistic and multi-disciplinary meta-discipline, like a roof constructed over several columns. These columns are constructed from knowledge and praxis from other disciplines that in some way or another are related to the theory and practice of problem solving. This building is by no means finished, the columns can be extended incorporating further material, and the roof can also be further expanded. Let us see shortly some of the elements of the columns.

The first column is designed from Neuro-psychology especially in what concerns rational and creative thinking and the functioning of the brain (Damasio, 1994). Several models of the brain explain different creativity resources of the individual; the most extended model has been developed by Herrmann (1996).

The next column is coming from Social-psychology, expressed in the works of C.G. Junk (1921) related to personality types and the way how single persons can contribute to work group, facilitation or decision-making. Another pillar in this column is the area of Group Sociology describing the conditions for fruitful work in groups (Dyer, 1987).

Another column is based in the field of Management and Consulting Work especially in what concerns facilitation of problem solving processes. Here the works of Heron (1999), Schwarz, R.M. (1994), Schein (1969), and Schön (1991) are rather central in what concerns the abilities and qualifications of the reflective practitioner.

There are several columns related to disciplines that are focusing on very specific areas of applications. These disciplines are based in highly rationalistic approaches either in a hard (quantitative methods) or soft (qualitative methods) version. This is for instance the case of Systems Development that deals with design of computerised systems for supporting problem solving, see the development of this area in Kynd (1996). And the discipline known as Strategic Development as formulated in the books of Minstberg (1994), which is focusing on organisations. Another discipline in this family is the area of Planning as formulated in the works of Ackoff (1999). Operational Research is a field belonging to this family focusing in optimal decision-making, see for instance Pidd (1996). Or, the sister discipline known as Systems Analysis (Miser and Quade, 1988). Finally there is the area of Product Design and Innovation as reflected in the books of Kelley (2001) and Janszen (2000).

Another family of columns represent those disciplines that give high priority to dialogue and participation in their methodology and praxis. Here we have a school of Sociology known as Participatory Action Research see for instance Whyte (1991). Management Sciences is a discipline that also belongs to this family as formulate by Churmann (1968). Here we have to add the areas practised in developing countries related to Popular Education, Social and Community Work, see further Fals Borda (1998) and Freire (1981).

Finally we have those disciplines focusing in critical and creative approaches that can be combined with rational approaches. This is the case of a new field known as Systems Thinking as formulated by Midgley (2000) where the ideas of boundaries, holism and system modelling are enhanced. Another new area is Creativity and Problem Solving, see for instance Goff (1998) and O´Dell (2001).

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