Organizational Creativity as a Prerequisite for the Generation of Innovation

Gerald Steiner

Institute of Innovation- and Environmental Management, University of Graz, Universitaetsstrasse 15, A-8010 Graz, Austria, gerald.steiner@uni-graz.at

Abstract

The creative performance capability within organizations depends on a comprehensive set of influencing factors such as personality traits and also – and this is the main focus of this paper – the design of the problem-solving process and the prevailing innovative climate. Furthermore, the question must be asked how to support the creation of ideas at an individual, organizational, and inter-organizational level in general. Here, the ability to generate ideas strongly depends on the creative capabilities of the involved entities.

In order to organize this complex system of creatively generating ideas, the "Planetary Model" is introduced. Different to most other models used for explaining creative processes, this model takes into account the dynamic interaction of such systems. Therefore, the understanding of the complex real-life process of creative problem-solving can better be understood. By combining this model with the various single stages of a sequential innovation process that can easily be translated into specific working steps, the project related performance can be improved by simultaneously providing for positive organizational effects in the long run, probably also leading to sustainable innovation.

Key Words: Creativity management, collaborative problem-solving, Planetary Model, change, knowledge, sustainable innovation, wisdom, complex problems, systems thinking

Introduction

Creativity is a prerequisite for the generation of innovation and is even of increasing interest when moving from incremental to radical innovation. In section two, creativity is considered in the context of knowledge and sustainability. Further, the role of creativity for innovation is briefly discussed and the question is asked: what kind of problems call for creativity or creative problem-solving processes? Consequently, in section three the various organizational forms of creativity are discussed. In order to understand the complexity of creative problem-solving, the Planetary Model is introduced in section four in order to point out determining as well as influencing factors of creative problem-solving processes. In a next step within section five the application of the Planetary Model within the innovation process is presented. Section six shows selected results of an empirical study on creative problem-solving within the Austrian and German industrial design branch. Finally, conclusions in regard to the question as to how prevailing shortcomings in the ability of many companies in utilizing their inherent creative capabilities can be overcome will round off this paper.

Creativity in the Context of Knowledge, Innovation, and Sustainability

It is characteristic of creative problem-solving that there is usually a broad set of options available for generating appropriate solutions. Further, in most cases there is only very limited understanding about the potential implications of a sustainability orientation with regard to the creation and the management of knowledge and innovation.

Creativity and creative problem-solving are always focused on the generation of solutions and ideas (for the differences between a solution and an idea see section four in this paper) and consequently on the creation of knowledge. Hereby, it needs to be stressed that the creative problem-solving process is by no means restricted to problems presented to the problem-solving agents. Instead, it is a characteristic of highly creative organizations and individuals that they continuously not only work on, but also search for new problems. Based on Popper's words "All life is problem solving" (Popper, 1999) this extension is fruitful certainly also for creative problem-solving processes.

Knowledge seems to be a prerequisite for all kinds of sustainable competitive advantages (Nonaka, Konno and Toyama, 2001; Drucker, 1993; Teece, Pisano and Shuen, 1997). As Nonaka et al. (2001) already pointed out, knowledge itself is dynamic and therefore cannot defined based on a traditional epistemological view that defines knowledge as "justified true belief". Despite this "absolute, static, and nonhuman view of knowledge" they address that knowledge is context-specific, relational, humanistic, dynamically created in social interactions, and is of either an explicit or implicit kind. Further, knowledge is distinctive from information. While the second can be considered as a flow of messages, the first is "created by that very flow of information and is anchored in the beliefs and commitment of its holder" and can be defined as "a dynamic human process of justifying personal belief toward the truth".

Change has become the determining factor of most facets of life. Further, creativity is the basis of every successful innovation as the means to cope with change (Peters, 1993, 44; Amabile, 1997, 40; Utterback, 1994; Ulrich, 1994, 7–14; Ford and Gioia, 1996, 878). Moreover, innovation can – under certain circumstances (described in the following paragraph) – also be supportive of the sustainable development of social, natural, and technical systems. As already stated at the beginning of this paper, it seems to be obvious that the more creativity is needed the higher the degree of innovativeness is, or in different words, radical innovations require more creativity than incremental ones (for further detailed distinctions between incremental and radical innovation, see for example Christensen (2000) and Christensen and Overdorf (2001, 103–130).

Innovation that contributes to sustainable development will be considered in the following as sustainable innovation. In more detail, sustainable innovation is innovation that is sustainable from an ethical, a social, an ecological, and an economic point of view.[1] Whereas the attainment of economically sustainable innovation seems obvious and can simultaneously be considered as sustainable competitiveness, the other facets of sustainability seem to be much more critical: Since within complex problem-solving people are of crucial interest, I only want to discuss the implications of socially sustainable innovation briefly: Whereas socially sustainable development in general is characterized by dynamic patterns, it is increasingly complex with regard to the development of innovation. Innovation is not only standing for the development of new and more appropriate solutions, but also may imply – to some degree – the destruction of former solutions (Schumpeter, 1980). However, these former solutions stand in close relation to people, such as its users or creators. Accordingly, it seems necessary to build awareness for such diverse effects on different stakeholder groups and not only make decisions based on a majority principle, but on intense communication and interaction in order to attain consensus if possible. For that purpose an extensive stakeholder analysis is the needed basis:

1. Who is concerned by the specific form of innovation (by considering internal and external stakeholders as well)?
2. What are the value systems and expectations of the stakeholders?
3. What might the roles of the stakeholders be within the innovation process (passively concerned or actively participating)?
4. How to deal with the specific roles future generations play?

It must be stated that creativity not only led to some of the beneficial developments of social, natural, and technical systems, but also to some of the most disastrous. This fact calls for an extended perspective of creative performances by taking into account social and ethical considerations. Talking about innovation, these considerations should not be only applied shortly before their implementation into the market, but already at the fundamentals of creativity, within definitions and models of creativity by integrating a holistically sustainability perspective!

With respect to this important topic the extraordinary contribution of Sternberg (2003) as a major scholar in the field of creativity and intelligence research should be mentioned in particular. He points out that some of the world's cruelest despots and greediest business tycoons can be considered as successfully intelligent, but at the expense of many other people. Therefore, besides intelligence and creativity it is wisdom that especially needs to be considered. Wisdom can be understood as "the value-laden application of tacit knowledge not only for one's own benefit but also for the benefit of others, in order to attain a common good". Further, Sternberg states, "The wise person realizes that what matters is not just knowledge, or the intellectual skills one applies to this knowledge, but how the knowledge is used". For a detailed review of major approaches to wisdom – from philosophical approaches and implicit-theoretical approaches to explicit-theoretical approaches – see Baltes and Staudinger (2000) and Sternberg (2000; 2003).

As a complex problem the development of innovations and specifically sustainable innovations can be characterized by the following system's peculiarities. It is typical for those problems that not only the target state of the problem-solving process is unknown or at least ambiguous, even the system's initial state cannot precisely be described (similar to the definition of ill-defined problems by Scholz and Tietje (2002, 26-27). Further characteristics of complex problems are the huge amount of interacting elements and subsystems in conjunction with high dynamics of the system leading to changing patterns and structures as well as intensities over time (Gomez and Probst, 1999, 22-24).

In contrast to complex problems, for simple problems the initial and the target state of the investigated system are well known. Additionally, such systems consist of only a small amount of elements with little interaction, but stable patterns over time (Gomez and Probst, 1999, 11–33). Consequently, this kind of problem can be solved by applying reproductive thinking without any specific or at most relatively simple methods.

Complicated problems are similar to simple problems characterized by defined initial and target states, but consist of comparatively more elements and with more interaction. In contrast to complex problems the patterns are still relatively stable over time. In order to solve those problems, more sophisticated methods are needed, although different to complex problems the problem is still of deterministic nature (Gomez and Probst, 1999, 11–33).

The development of an innovation is always heavily influenced by a wide variety of impact factors that are not controlled or even not known by the innovator. Especially the overall target of an ethically, socially, ecologically, and economically sustainable development of any system is quite vague, so that there is definitely no clear target state to aim at. We are confronted with a highly complex situation with dynamic, non-linear phenomena. Therefore, understanding the complex relations between humankind and nature is a prerequisite for overcoming cognitive barriers (Scholz et al. 1998, 16).

Because of their specific characteristics complex problems usually cannot be solved by applying standard solutions (which are nevertheless useful for simple and complicated problems). Instead, complex problem ask for innovative solutions, which require creative problem-solving capabilities from the problem-solving agents. In this work the "Planetary Model" is used as a basis for dealing with the complexity of sustainable innovation by utilizing the given creative capabilities.

First, in order to generate creative solutions for complex systems, a more holistic system's view is required instead of specializing on ever smaller system's units. Authors such as Probst, Raub and Romhardt (1999, 187) stress that complex problems cannot be solved by mono-causal thinking within linear cause-effect relations, but instead require holistic systems thinking or a socio-cybernetics point of view (von Bertalanffy, 1998; Wiener, 1948; Forrester, 1961; Ulrich, 1968; von Foerster and von Glasersfeld, (1999); Probst and Gomez, 1991; Gomez and Probst, 1999; Mulej, 1995). Additionally, besides rational and convergent thinking the dynamics of such systems with permanently changing patterns require the development of new and creative approaches for solving these complex problems with an extension to teamwork, organizational, and inter-organizational problem-solving processes. Informal systems thinking and the dialectical systems theory proposed by Mulej might therefore be very useful to avoid getting lost or otherwise being too restrictive or too specific when working on complex problems (Mulej et al. 2004; Mulej et al. 2003).

Organizational Levels of Creativity

In order to enhance the overall creative abilities within a system it seems necessary to enlarge the view of the creative individual by also taking into account the various organizational levels of creativity. Those can be divided into:

1. Individual creativity
2. Group creativity
3. Organizational creativity
4. Inter-organizational creativity

By focusing on an individual, the creative performance can be understood as a function of attention, intrinsic motivation, time, and knowledge (see equation (1)) (Steiner, 2006).

$$CP(Ind.)= f(A, Mi, T, K)$$

CP(Ind.)..................... Creative Performance of the individual
A................................ Attention
MI.............................. Intrinsic Motivation
T................................ Time
K................................ Knowledge

The peculiarities of theses single factors of the individual creative performance are:

- Every single factor has to be provided.
- No single factor can be substituted by others.
- The interplay between the single factors builds the basis for a potential creative performance of the individual.

By going a step further, within a collaborative problem-solving process such as a group or an organization, the overall creativity is much harder to determine, since it cannot be assumed that this is just the sum of the single individual performances, but instead synergies might allow creative solutions to emerge that are the result of associative thinking among different people with different backgrounds, different experiences, different value systems, and different expectations (Steiner, 2006; Risopoulos, Posch and Steiner, 2004).

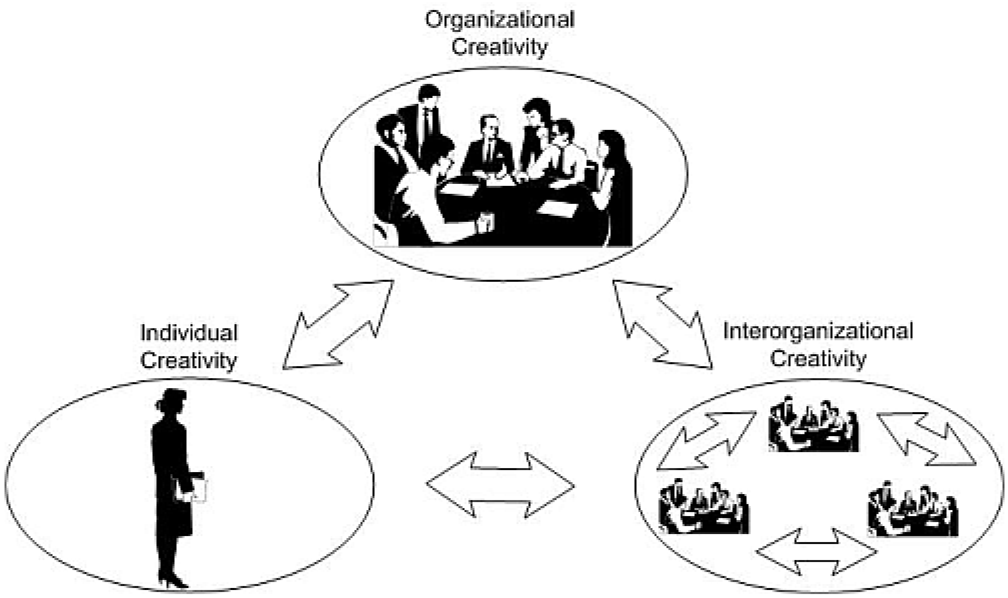

Figure 1: Levels of Creativity

Having the focus on corporations, in addition to these structural considerations on creativity, it is also necessary to distinguish between internal and external creative capabilities. Here, internal creativity refers to the creative capabilities of the internal stakeholders of the organization – individuals and also groups – such as employees and stockholders. On the other hand, external creativity is standing for the creative capabilities of those individuals, groups, and organizations that contribute to defined projects with their creative capabilities as non-members of the considered organization.

As a consequence, it also must be asked how the interplay between internal and external creativity can be best designed. In order to constructively and synergistically include external creativity within the organization, the crucial roles of a common and "understandable" language, complementary value systems and personality profiles, and clearly defined competences become obvious. This is especially true because of the sensitivity of most creative problem-solving processes.

The Planetary Model: A Framework for Dealing with Creativity

The Planetary Model can roughly be divided into three dimensions: In the middle of the Planetary Model there is the sun, standing for the solutions and ideas generated within the problem-solving process. Whereas both solutions and ideas are outcomes of the creative problem-solving process, solutions are directly connected to a certain problem and an idea has no obvious relation to the problem one was working on. The sun is surrounded by the planets, which stand for the various phases of the creative problem-solving process. The sun and all the planets are embedded within cosmic clouds, standing for the needed thinking styles and competences, as well as the innovative climate together (see figure 2).

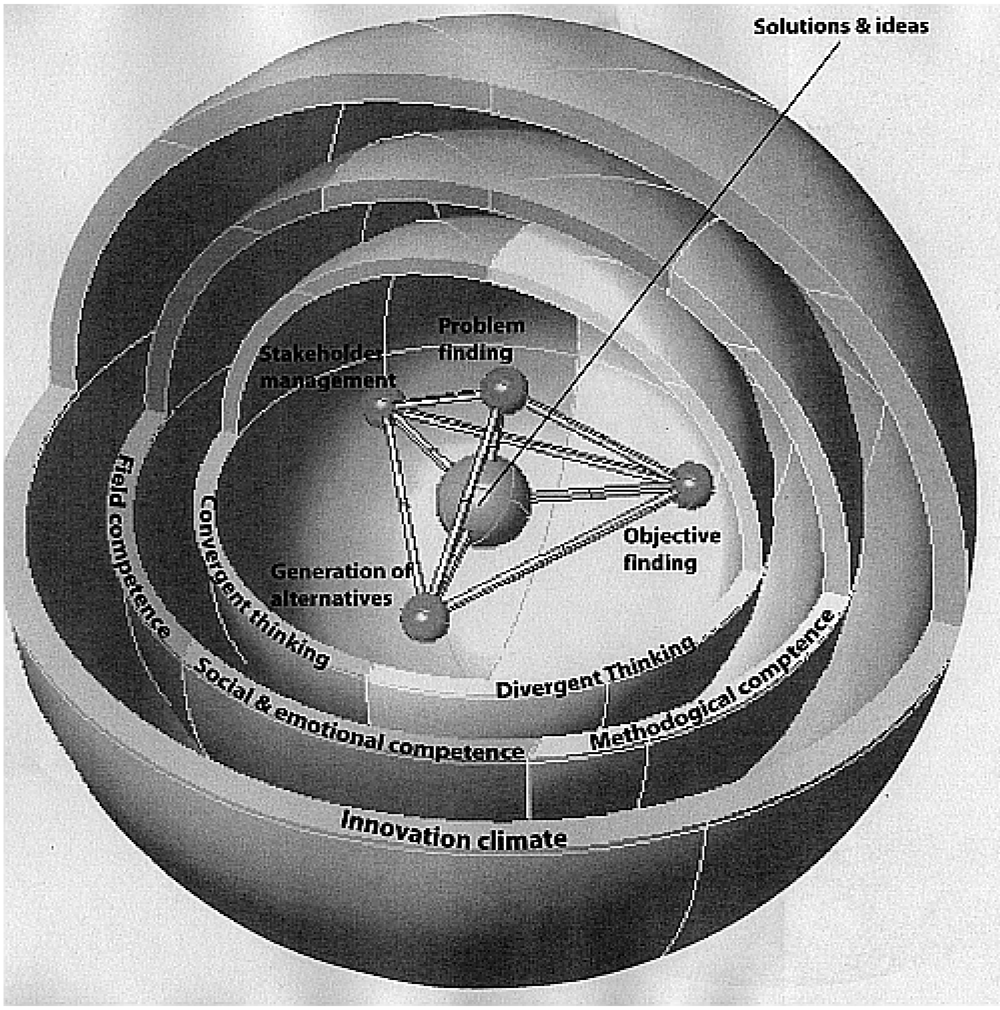

Figure 2: Planetary Model: A Dynamic Creativity Management Model for Solving Complex Problems (modified on the basis of Steiner, 2003; Steiner, 2006)

Since the whole system is strongly interconnected, the planets can neither be seen in isolation from each other nor as isolated from the influence of the rest of the cosmos. They are continuously interacting. These interdependences also lead to permanently changing pattern. Circularity instead of linearity becomes the determining element.

By focusing on the single planets, it becomes obvious that each planet itself stands for another more detailed micro-cosmos, in which single moons (as subsystems of the single planets) are surrounding the planets in a dynamically interacting way. Moreover, the moons are influenced by the other planets and the cosmic clouds as well (see figure 3).

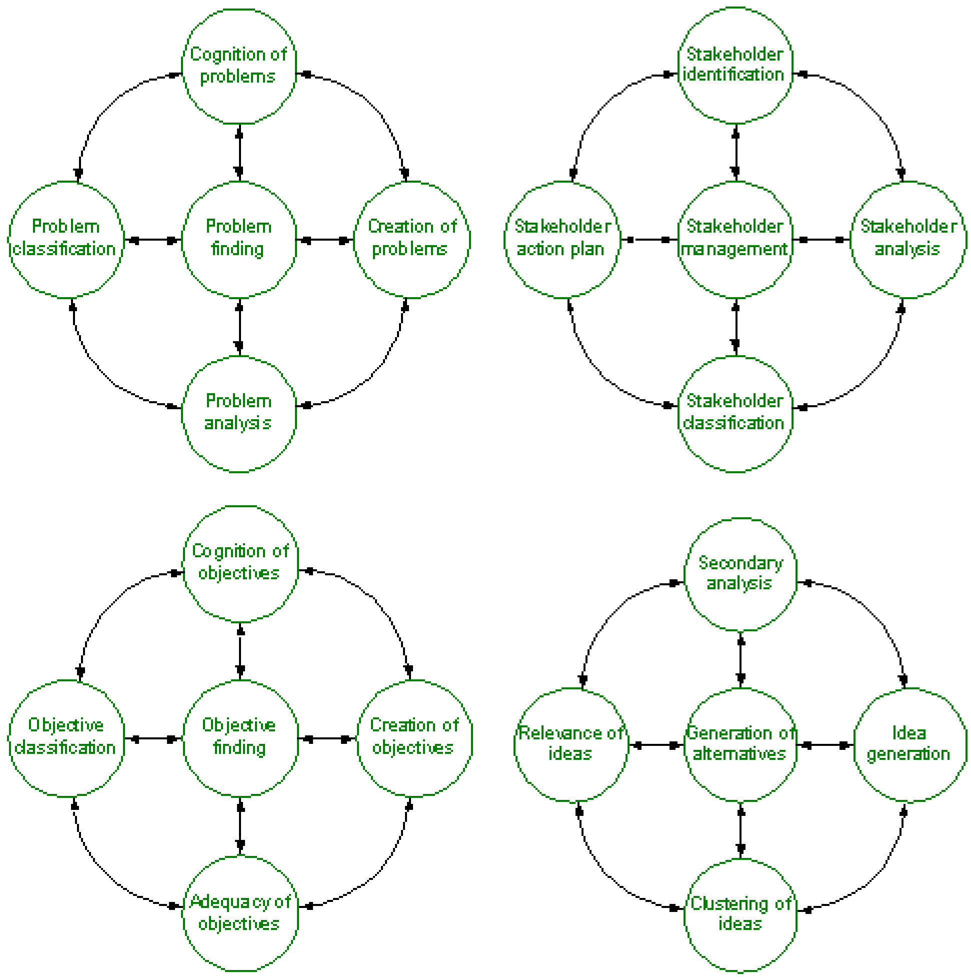

Figure 3: Planetary Model: the planets with their moons

The planet “Problem finding” is surrounded by the moons “Cognition of problems”, “Creation of problems”, “Problem analysis”, and “Problem classification”. The planet “Stakeholder management” is surrounded by the moons “Stakeholder identification”, “Stakeholder analysis”, “Stakeholder classification”, and “Stakeholder action plan”. The planet “Objective finding” is surrounded by the moons “Cognition of objectives”, “Creation of objectives”, “Adequacy of objectives”, and “Objective classification”. The planet “Generation of alternatives” is surrounded by the moons “Secondary analysis”, “Idea generation”, “Clustering of ideas”, and “Relevance of ideas” (for a detailed explanation see Steiner (2006).

Although the sun includes specific procedures of instrumental evaluation and selection, in real world scenarios this is only one facet of evaluation and selection. Whereas in the context of the sun there is a concentration on potential solutions dependent on a generated set of alternatives, formal as well as informal evaluation and selection procedures also occur at all other planets and moons, whether talking about the interpretation of a problem, the construction of goals or the choice of certain creativity techniques that have to be applied.

Furthermore, it seems necessary to broaden the paradigms of many traditional approaches of innovation management, whereby problems are often considered as something given. Within sustainability-oriented change processes a shared vision between the various stakeholders acts as a set of meta-objectives that is usually not something given, instead it very often has to be constructed. Additionally, as expressed in the planet “Objective finding”, cognitive processes play an important role. Hereby, the planet "Stakeholder management” is influencing strongly the process of the creation of a shared vision among the problem-solving agents and other stakeholders. Consequently, the linearity of cause and effect can no longer be assumed. Therefore, the “Planetary Model” can support problem-solving agents who are working together with other stakeholders on the complex task of developing sustainable innovation, including students and teachers within certain systems like case studies (e.g. in a regional context) (concerning case studies see also Steiner and Laws, 2006).

It is necessary to stress the importance of combining this model with other effective tools. The “Planetary Model” is thought to support the innovators who are working in transdisciplinary teams (Steiner and Posch, 2006; Thompson Klein, 2001) towards the development of a sustainable innovation.

The Planetary Model as a Guide within the Innovation Process

As shown, the Planetary Model realistically determines how creative solutions and other ideas are generated within the process of problem-solving. Nevertheless, the problem-solving agents need further process orientation when working on complex problems. In the following I point out how the Planetary Model provides for an understanding of creative processes by simultaneously giving orientation by a sequential process order without being confronted with the risk of oversimplification. In fact, the Planetary Model could be combined with every other sequential process guide. Here, working steps are introduced that are especially adequate when working on complex real-world problems.

The underlying working process is roughly divided into four main interconnected phases:[2]

1. System analysis and design
2. Conceptualization
3. Specification
4. Selection and implementation

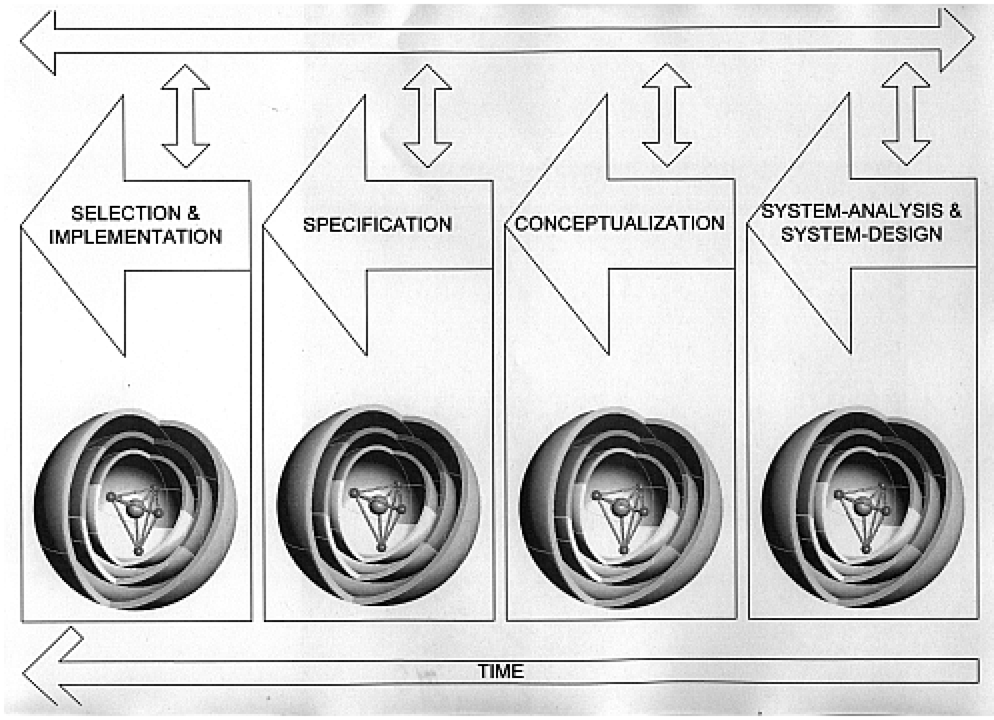

Figure 4: Creativity management within the innovation process

System-analysis and system-design is used to understand the underlying system, its main elements and interdependencies, its structure and patterns of behavior, its environment and its initial state, together with some rough ideas or a rough vision of the target state of the system. Based on the understanding of this system within the conceptualization, different variants for future developments of the systems or potential solutions for an improvement of the underlying system are created by applying all kinds of rational and creative means. Within the specification stage it is the goal to choose among potential alternatives, reduce them to the most promising ones, and move forward to more detailed developments. At the last stage a final selection between the remaining potential alternatives is the basis for further measures of implementation of the final outcome of the whole innovation process.

Real-world innovation processes such as product development processes require an easily understandable project structure in order to give the project team orientation. The danger of reducing a complex system, such as the underlying creative problem-solving process needed for the creation of an innovation, to an easily understandable, interconnected four-stage working process that is also easy to communicate lies in the potential of dangerously oversimplifying a complex problem and consequently being confronted with the negative outcome of having neglected important system peculiarities.

In order to overcome that potential danger I suggest a two-dimensional procedure for the working process. Firstly, the four stages of system-analysis and system-design, conceptualization, specification, and selection and implementation are the basis of structuring and guiding the working process in the sense of a project management philosophy. Secondly, every stage has always to be seen in the context of its implications for the whole problem-solving process, expressed within the Planetary Model. That means each stage always has to be considered with regard to the problem, the system of objectives, the implications for the various stakeholders, and the influence on the generation of alternatives in interplay with the needed thinking styles and competences, and also in interplay with the innovative climate.

By going from one stage of the innovation process to the other and consequently moving along the time-line, the system itself is achieving increasingly precise, higher concreteness about the target state of the system. Potential solutions are attained, together with an improved level of knowledge, not only concerning the potential solutions but also with regard to the gained process capabilities and experiences.

The model described here has been applied in various projects within industrial design, mainly as part of a joint endeavor of the School of Industrial Design at the University of Applied Sciences in Graz together with various companies such as Audi and BMW. The model has also been used in other real-world innovation projects done in cooperation with industry and industrial design companies (Steiner, 2005; Steiner, Strebel, Jarz and Pfeiffer, 2003).

Conclusion

As it has been pointed out in this paper, the understanding of the complex real-life process of creative problem-solving is to be considered as a basis for improving the overall creative performance capabilities of an organization. Therefore, it was suggested to extend innovation models by using creativity-related issues, such as the Planetary System for creative problem-solving.

It has to be pointed out that in order to better understand innovation processes, further interdisciplinary research is needed with the focus on creative problem-solving processes. Here, specific demand for action is given especially with regard to further scientific investigations on the process of problem finding, the innovation climate, and collaborative problem-solving processes. Concentrating purely on traits approaches or the application of methods supportive of the generation of creative ideas is far too limited and only helps to understand isolated subsystems of the overall system of organizational creativity.

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[1]
Sustainability affairs are not going to be discussed extensively in this paper. For that see WCED, 1987; UN, 1992; Perman, 1997; Strebel, 2002; Strebel, 1997; Laws et al., 2002; Steiner and Posch, 2006.
[2]
An example of a broadly applied three-stage innovation process is the one provided by Thom (1980).