

Creativity Management in Sustainability Networks

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Abstract

In this contribution recycling networks are used as a starting point for the concept of sustainability networks. Those are complex systems, defined as 'systems of voluntary but organized cooperation among different stakeholders with the common vision of sustainable development of society within a certain region'. In order to develop and manage such complex systems, creative action will be required at various phases. Therefore a creativity management model is introduced which tries to provide for the necessary broadened perspective of problem solving within sustainability networks.

Introduction

In order to explain the new idea of sustainability networks the concept of recycling networks will be introduced and explained by focusing on certain aspects of the famous recycling network Styria. On this basis the characteristics of sustainability networks and the motives for membership will be discussed. In a further step we point out that the concept of sustainability networks is a highly complex problem and conse-

quently is connected to the ability of the considered system to effectively manage creative action. A dynamic model for creativity management will be introduced as a basis for the development of particular steps of creative problem solving within such networks, such as the formation of adequate teams, the creation of new product alternatives for by-products, but also the development of alternatives of action in order to attain objectives on a meta level such as the protection of the environment.

Sustainability networks

In the last few decades many industrial organizations have implemented an environmental management system (EMS) to comply with international standards, such as ISO 14000 and EMAS regulations. In addition to these intra-organizational activities the concept of 'industrial symbiosis', emphasizing similarities between natural and industrial ecosystems, has emerged. The fact that a natural ecosystem tends to recycle all materials biologically, using only energy from the sun to 'drive' the system, is used as a metaphor for industrial systems (Ayres & Ayres 1996, pp 278-279).

Recycling networks as starting-point

The main idea of this attractive concept is to design industrial systems in a way that the by-products ("waste") produced by one company is used as a raw material by another company. The aim is to minimize the industries' impact on the environment by building up closed loops of material and energy use within the industrial system. The best documented example here is Kalundborg in Denmark, but the industrial recycling network in Styria, Austria has also become a very famous case in the field of industrial symbiosis (Strebel 2002, pp 118-121). While in Europe the main focus lies on the waste exchange relationships between existing companies

within a certain area (Schwarz 1994, pp 115-130; Wallner 1999, pp 55-56; Strebel 2000, p 295), overseas the construction of so-called eco-industrial parks is considered the most effective way to implement the concept (Chertow 1998, pp 8-10). Whatever the case, the protection of

the environment as the ultimate goal is achieved through collaboration and inter-company partnering. The totality of the firms involved and the recycling-oriented collaborative relationships between them is often represented in diagrams with vectors for each waste-flow.

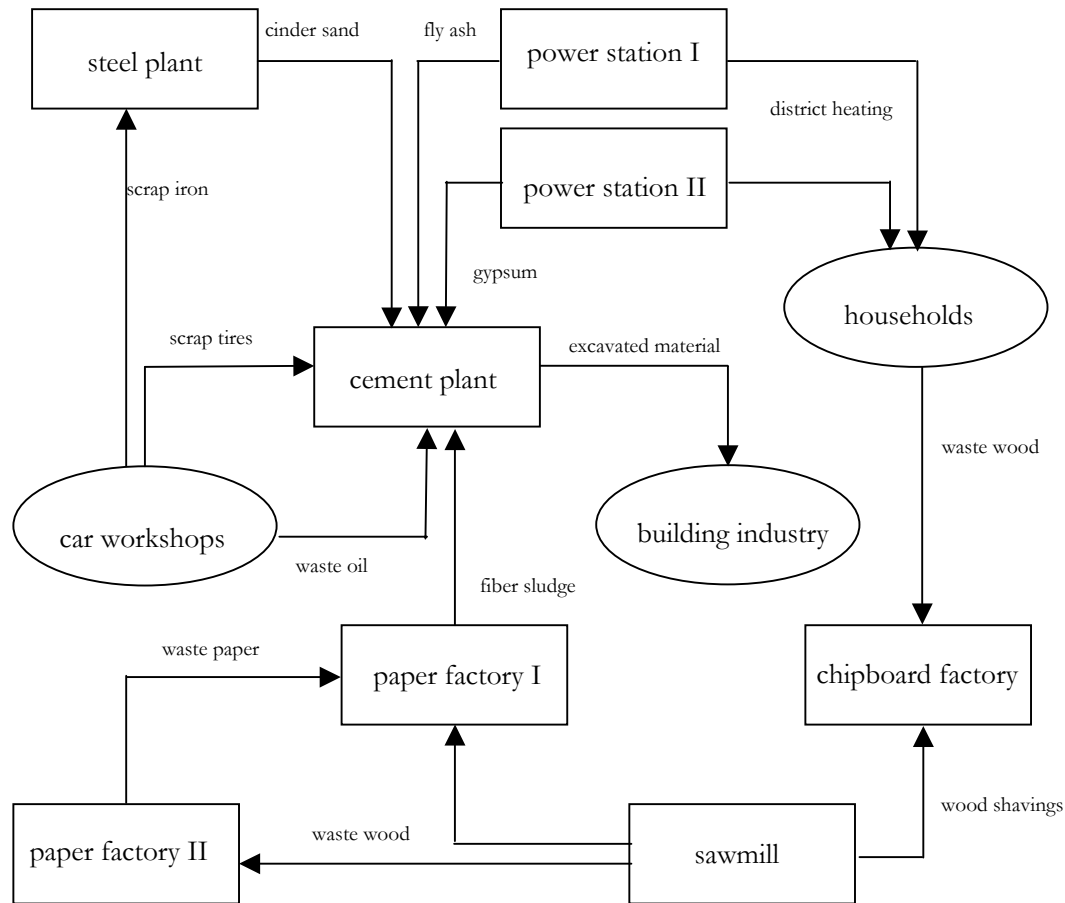


Figure 1: Part of the recycling-network Styria (Posch et al. 1998, pp 220-221)

Characteristic for recycling networks is the participation of several different industries, since this makes a higher variety of processes available for potential recycling activities. Except for those industries where highly organized markets for recycling residuals are already used, such as in waste paper or scrap iron, recycling within a single industry usually is not inter- but intra-organizational.

The Concept of Sustainability Networks

The aim of this chapter is to show how these inter-organizational recycling activities between various industries can be used as starting point for ‘sustainability networks’. For this the currently rather narrow view of recycling cooperation between industries needs to be broadened to include the following:

- Firstly, environmental protection is more than the recycling of material. In fact, recycling is an end-of-pipe-activity and therefore counts only as a second best solution. It does not aim to avoid or reduce the negative outcome of production processes at the origin, but only tries to reduce the negative impact on the environment by reusing the existing by-products. In contrast, Clean Production aims to modify the production processes at a more fundamental level so that no production waste will be produced at all. Or Design for the Environment, a product-oriented approach, suggests dematerializing goods while still retaining their capacity to function.
- Secondly, sustainability is more than environmental protection. According to the famous Brundtland Report of the World Commission on Environment and Development, sustainable development is a “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED 1987, p 8). Among the many attempts for more precise definitions (Perman 1997, pp 51-78) the triple bottom line approach stands out: here sustainability implies economic prosperity, environmental quality and social justice – an element which business has largely overlooked. (Ulrich 2001, p 1) “Those who think that sustainability is only a matter of pollution control are missing the bigger picture.” (Elkington 1999, pp 70-71).
- Thirdly, sustainable development requires the involvement of all actors – not only industry. A major step was undertaken with the move from intra-organizational environmental management to recycling networks. The next necessary step is the move from recycling networks to the so-called sustainability networks integrating all relevant stakeholders in a sustainable regional development.

This leads us to the definition of sustainability networks as ‘systems of voluntary but organized cooperation among different stakeholders with

the common target of sustainable development of society within a certain region’. A very important term in this definition is ‘stakeholders’. They are defined here as ‘persons or groups of persons who pursue interests in the context of the regional development or who are affected positively or negatively by the activity under investigation’. This definition differs considerably from the original version of the Stanford Research Institute, according to which stakeholders are defined as ‘those groups without whose support the organization would cease to exist’. It is much closer to the extended definition of Freemann, whereby ‘any group or individual who can affect or is affected by the achievement of the organization’s objectives’ can be called a stakeholder. (Freemann 1984, pp 31 and 46). However, it needs to be noted that the definition used here does not refer to any single organization, but rather to the development of the whole region. Also the question arises whether the term ‘persons or group of persons, whose interests are hurt’ also includes future generations, whose possibilities to meet their own needs may be compromised by the respective project. This generates a link to the definition of sustainability by the WCED, but obviously also leads to the question, who at all would be able to represent them in the sustainability network. In fact, it does not seem to make a lot of sense to include future generations in the definition of stakeholders, since their interests are already implicitly protected by the overall objective of the sustainability network anyway.

Membership in sustainability networks is voluntary. Obviously compulsory membership would be highly counterproductive. But why might private persons or groups, companies or even public or governmental organizations take part in a sustainability network? In general there are two possible motives for membership:

- On the one hand, there can simply be economic reasons whenever activities within the

sustainability network also lead to profits. In fact, inter-organizational recycling activities between companies within a recycling network are a good example of environmentally and economically advantageous behavior. Recycling networks such as those in Styria would never have developed if there had not been clear economic advantages for the firms involved, e.g. lower prices for recycled materials than for raw materials or cheaper/safer disposal of by-products.

- On the other hand, it can not be denied that economic, environmental and social win-win-win-situations for all stakeholders do not always exist. Hence, the objective of sustainable development does need to be a normative one. In terms of Kant's categorical imperative it becomes obvious that caring for future well-being is an ethical obligation for the whole of society. That we need to act responsibly towards our descendants is clear, but the extent of this responsibility is still matter of discussion.

Although, in practice, the exchange of by-products for recycling purposes may still count as the most important activity within these sustainability networks, the field of potential cooperation is in fact much larger. For example, common R&D-activities leading to environmentally oriented innovation, continuous improvement, and common knowledge management could all be established. Moreover, infrastructure might be shared, such as in the case of common sewage plants or car-sharing-activities.

What does it take to initiate such cooperation between stakeholders and to promote cooperative activity over time? How to organize these activities to scope with such complex situations? How can these complex problems be solved? Anyhow, management of a sustainability network needs to be supported by an adequate creativity management.

The Role of Creativity Management in Sustainability Networks

Sustainability in general, and certainly the problem solving process within sustainability networks, are very complex. There is usually no one-way option and also little experience for attaining the targets of a sustainable development and the establishment of sustainability networks. Furthermore, the system of sustainability networks is not of deterministic, but more of chaotic nature. Consequently, such complex systems requires also an adaptive and dynamic style of problem solving. In order to provide for such a broadened perspective of the problem solving process, we will first ask a set of questions based on dialectical systems thinking (Mulej 1976). Based on this, a dynamic model of creativity management will be introduced together with implications for sustainability considerations.

Questions to be Asked

The here described model does not call for a new thinking paradigm: it is not about killing the paradigm of logical thinking, neither the underlying philosophy of a deterministic world; it is about flexibly applying the "most suitable thinking tool" to the appropriate situation. Therefore, the following questions have to be asked:

- Do we already know the problem and if not how can we find out about it?
- What kind of problem is it?
- Who are the stakeholders in the context of the problem?
- What objectives can be defined for the different stakeholders?
- What are the overall objectives for the problem solving process in the context of sustainability?
- What resources can be made available for the problem solving process (including human capital in the form of field-specific

competence, methodological competence, and social competence)?

- What actors have to be involved at which stage of the problem solving process?
- Are there certain behavior typologies and patterns of attitudes which are characteristic for the single problem solving agents?
- When is individual and when is team problem solving needed?
- What sort of working atmosphere is required in order to be as supportive as possible to the problem solving process?
- How much guidance or instructions are needed in relation to allowing freedom for flexible acting?
- How does the system and its characteristics and the internal and external pattern of interaction develop over time?

This form of sensitizing by asking these first-hand questions is the basis for the introduction of a creativity management model that is used as a framework on the journey from finding or defining the problem, establishing the adequate set of targets and working on appropriate solutions in order to attain sustainable development. Flexibility has to be a core characteristic within the problem solving process in order to be capable to consider the peculiarities of the “growing” and changing sustainability network.

Since sustainable development is a highly complex task, purely deterministic paradigms are much too limited for observing, perceiving, and steering such systems – whether we are talking about families, companies, networks of companies, regions, economies, countries or the whole world.

Instead of rigid policies, sustainability calls for

- the application of the dialectical systems theory to obtain a holistic systems view that considers all and only essential viewpoints and systems (Mulej 1976),
- interdisciplinary creative cooperation (Mulej 1998; Steiner & Posch 2002, pp 215-216),

- transdisciplinary cooperation with stakeholders (Steiner & Posch 2002), and
- dynamic creative problem solving approaches based on a synergetic application of vertical and lateral thinking, requiring logically but also emotionally rooted intelligence.

Requirements for creative problem solving

Similar to the yin that cannot exist without the yang, the core philosophy behind the described model is that for a sustainable development the creative problem solving process has to include both:

1. logical-analytical and creative problem solving,
2. individual and group achievements,
3. vertical and lateral thinking (or convergent and divergent thinking),
4. IQ and EI (emotional intelligence),
5. extrinsic and intrinsic motivation,
6. specialization and holism,
7. linearity and circularity, and
8. structure and deterministic chaos.

The whole process of creative problem solving is a complex system in itself, dynamically changing over time, with permanently interacting system elements, it requires a systems thinking perspective in order to be understood and applied.

Further, creative problem solving is not about making a decision between knowledge-based and emotion-based problem solving processes: As Mulej states, “both knowledge and emotions are to be included since they are interdependent, just as the left and right parts of the brain are interdependent.” (Mulej 1998, p 282). Creative problem solving is a prerequisite in the attempt to find solutions for complex problems. A big challenge for the future will be to move away from dualism towards a synergetic and symbiotic based paradigm. Dynamic creative problem solving requires both knowledge and emotions, IQ

and EI, convergent and divergent thinking, individual and group achievements, focused and holistic perspectives.

Introduction of a Dynamic Creativity Management Model: An Overview¹

What are the core characteristics of a dynamic creativity management model? Dynamic creativity management has its field of application as functioning as an approach for handling complex problems, i.e. as a supporting tool within sustainability networks. This not only includes finding new appropriate product alternatives

made of by-products, but also developing appropriate strategies for environmental protection, and further more the development of strategies for getting all relevant stakeholders involved into the problem solving process.

In the following, a dynamic model of creativity management called planetary system is introduced. In this model creative problem solving is understood as a circular complex system, embedded within “cosmic clouds” that are influencing the problem solving process. The outcome of the process can be understood as the degree of realization of sustainability within a given network of actors.

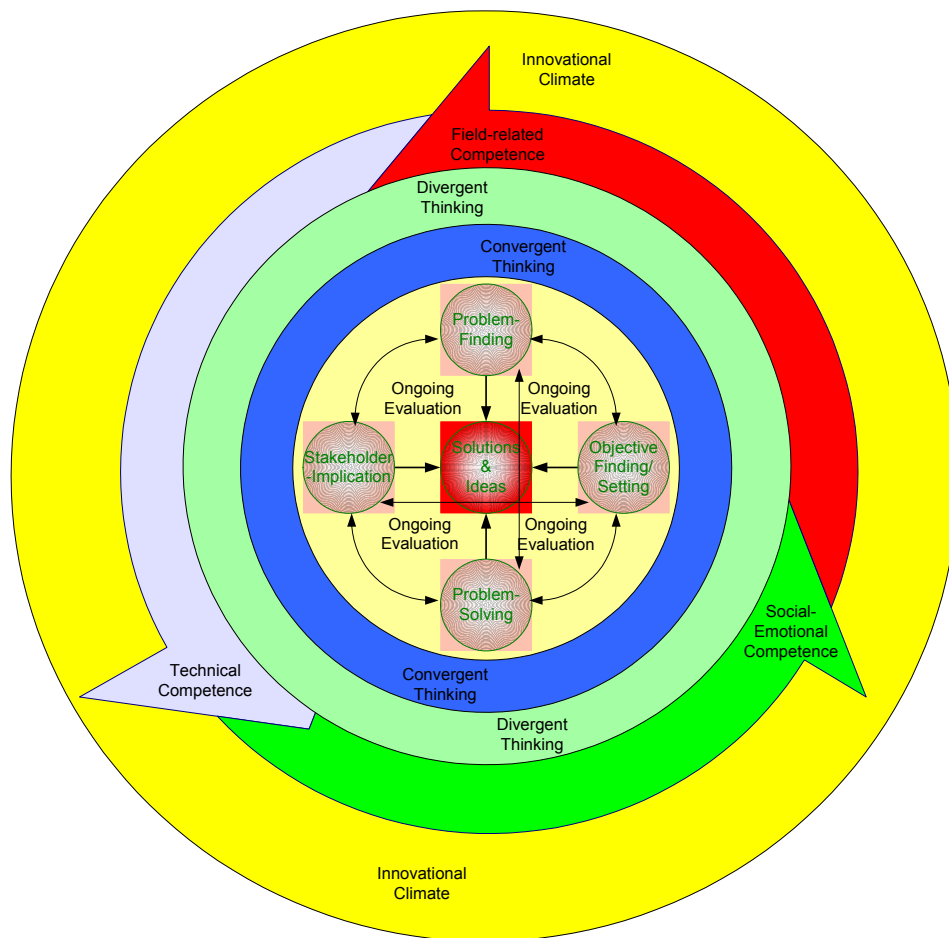


Figure 2: Planetary System: A Dynamic Creativity Management Model (Steiner 2002; Steiner 2003)

The “planetary system” can roughly be divided into three dimensions: In the middle of the planetary system we have the sun, standing for the solutions and ideas generated within the problem solving process. The sun is surrounded by the planets, standing for the various phases of the problem solving process. The sun and all the planets are embedded within cosmic clouds, standing for the needed thinking styles, competences, and innovation climate.

Since the whole system is strongly interconnected, the planets can neither be seen isolated from each other nor from the influence of the rest of the cosmos, but they are continuously interacting. These interdependences also lead to a 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 the single sub-systems are dynamically interacting with each other. Moreover, the single sub-systems are influenced in the same way by the other planets as are the cosmic clouds: The planet “problem finding” includes the sub-systems cognition and effect, problem construction and discovery, problem-analysis and description, and problem classification. The planet “objective finding and setting” includes the sub-systems cognition and effect, objective analysis and description, objective classification, and vision and strategy compatibility. The planet “problem solving” includes the sub-systems secondary data collection, primary idea generation, idea clustering and synergies, and problem compatibility. The planet “stakeholder implications” includes the sub-systems stakeholder identification, stakeholder analysis and description, stakeholder classification, and stakeholder action plan.

Finding and Analyzing the Problem

Whereas most previous creative problem solving approaches have usually been applied to generate solutions to a given set of problems, the approach developed here moves a step back and takes as its starting point the earlier stage of problem finding. This is then followed by problem analysis and formulation, generation of objectives, coordination with the focused vision and strategy, generation of problem solutions and finally, the evaluation and choice of the most promising alternative against the backdrop of sustainable development.

Central to such an approach is the idea that all of these phases are seen to be constantly reacting and interacting with one another as part of a dynamic whole, embedded within an innovative climate that can be influenced to different degrees. (The potential for reorganizing or changing the characteristics of the single system elements differs, especially as regards the duration of the necessary intervention). Imperative competences comprising IQ and EI are also essential. The linearity of cause and effect can no longer be assumed!

Also determining the design of the problem solving process including the choice of the problem solving techniques are the specific characteristics of the problem itself as well as the mutual relations within the overall context of the influencing systems. These could include managing tasks undertaken or required for the development of specific solutions in the form of products for companies or even for the generation of alternatives for the development of whole regions facing problems of a holistic nature, where the mutual interactions of economic, ecological, social and cultural aspects all need to be taken into account. Embedded in the patterns of change, there is a wide variety of tasks or problems which we have to deal with. In this context it helps to be aware of the kind of problem or task that is given, in order to know what kind of

thinking or what combination of thinking best meets the requirements of the given problem. Similar to Gomez & Probst we distinguish between the following types of problems (Gomez, Probst 1999; Probst & Gomez 1991, pp 3-20):

- Simple problems have few influencing dimensions (= elements), little interaction between the elements and relatively stable patterns of interaction over time. Standard solutions already exist, the problem solving process is predominated by logic and convergent thinking.
- Complicated problems have many elements, strong interaction between the elements and relatively stable patterns over time. A first step in dealing with complicated problems is to try to divide the problem into sub-problems which can be treated as simple problems. Once the pattern of interaction is understood, it will not change tremendously over time. Therefore, the recognition of this pattern might require a certain degree of creativity. However, the rest of the problem solving process will be based on logic and convergent thinking.
- Complex problems have many elements, strong interaction between the elements and dynamically changing patterns over time. Problems such as the development and the

managing of sustainability networks or attaining sustainability in general are typically problems for which no standard solutions are available and therefore new innovative steps have to be taken. Therefore, a creative problem solving process is required, in which divergent (lateral) thinking, circularity, holism and, consequently, systems thinking and logical-analytical considerations interact in a dynamic way.

Defining the goals

Defining a vision of the sustainability network that is shared by all members of the sustainability network is a crucial task. While the core mission of an organization is usually strongly determined by the respective business field and historical development of the company, achieving consensus on objectives of a sustainability-network is much more difficult as the experience and attitudes of the persons involved may differ considerably. But the network's vision is the most important basis, from which the objectives of the network are to be derived. A prerequisite for defining the network's vision is information about the status quo, e.g. about the environmental impact of the region's activities or the social situation of the inhabitants.

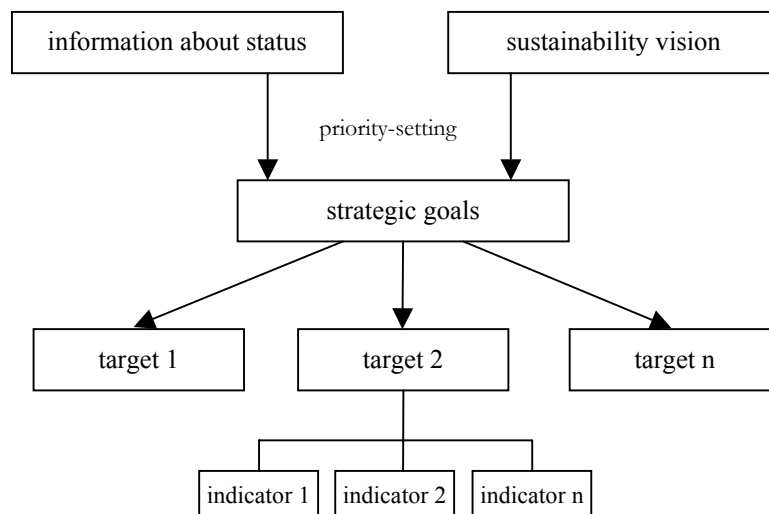


Figure 3: Objectives of a sustainability-network

In general, it is the totality of the institutions and persons involved which needs to be taken into consideration when trying to clarify and translate the network's vision and mission into concrete strategies and specific strategic objectives. Traditional company objectives emphasize revenue, costs, cash flow or profitability, whereas those of sustainability-networks contain not only monetary but also technical-physical measures like energy consumption or waste production, plus further more complex objectives such as the justice of the income distribution, which do not lend themselves to easy quantification at all.

Further, these strategic objectives must be translated into a sufficient number of relevant and understandable targets, which then need to be communicated throughout the whole network. The single activities of all members ought to be focused on the network's objectives and targets. It is obvious that the participating companies need to gain profitability, at least to remain competitive in the long term. The compatibility of economic and non-economic goals in a competitive setting has long been subject of discussion in the literature. Whatever, only in the case where a company has expressed interest in sustainability and has therefore set itself not only economic but also environmental and social objectives to achieve, does it make sense for the company to play an active role within a sustainability-network. As there is a high probability that there are dependencies between economic and environmental or social objectives in whatever manner and direction, the management system of the sustainability network must not be separated from the traditional core business strategies and management systems of the participating companies. Correspondence between individual and network objectives is essential, since it provides a basic prerequisite for cooperation.

The most critical success factor in developing a management information system is the defini-

tion of a comprehensive set of suitable performance measures or indicators. These should closely refer to the targets and thus provide a framework for continual environmental, social and economic evaluation of the activities within the network. Certainly, the choice of indicators strongly depends on the nature and scale of the sustainability network and the stakeholders involved. Nevertheless, it is crucial that the set of indicators is not a mere collection of piecemeal measures but should rather be a linked series of critical indicators that are internally consistent and related to the overall vision of sustainable development. In terms of the management approach of Kaplan/Norton, this could be seen as a form of 'Sustainability Balanced Scorecard' (Kaplan & Norton 1996).

The set of sustainability-performance indicators of a whole network is the basis for the performance indicators of the members. In this way, the network's objectives and targets are cascaded down to local units of responsibility allowing them to work coherently towards the strategic goals of the sustainability-network. It is thus crucial to combine environmental, social and economic performance measures in a way that provides decision makers with an appropriate set of measures. In future, both benchmarking within the network, and especially benchmarking between networks, will also help to incorporate existing best practice and to verify that the proposed targets do indeed assess network sustainability.

Generating solutions: Applying the appropriate Problem Solving Techniques

As mentioned before, it is of tremendous importance to design the problem solving process in an appropriate way according to the given system peculiarities. One specific step within the design process is the choice of applicable problem solving techniques.

There are countless techniques for the different

stages of problem solving available, but in order to build a framework of general conditions – including the choice of applicable techniques – supportive to the whole process, there has to be an awareness that the system has to be dynamically adapted to the prevailing system situation according to the characteristics of the single influencing factors. If these factors are not considered in the choice of applicable techniques (see model in figure 2), then, similar to a mechanical factory, the application of the wrong tool, even it is of the highest quality and reliability, will not lead to a contribution for the solution of the problem or task, but will instead be useless or even harmful.

As an example, within the choice of the problem solving techniques (creativity techniques included), the patterns of behavior and attitudes – including the position in the organization or group, general patterns of behavior, and also the private background of the individuals etc. – have to be taken into account. A practicable possibility to guide through the process of finding out the prevailing patterns of behavior from a neutral point of view is the application of analytical instruments as LIFO (Czichos 2001, pp 74-176). The main objectives with the application of instruments such as this are to help the problem solving actors get to know themselves and their problem solving team members better, consequently establishing a kind of proactive conflict management, and a basis for team formations with special regards to required patterns of behavior for specific stages and tasks in the creative problem solving process.

The given stage of the problem solving process and the prevailing characteristics of the system elements as described in the model build the platform upon which a set of creativity and problem solving techniques can be chosen to be applied within the problem solving process.

Decision-making and Innovation in Teams

The given preconditions for the creative problem solving process are that the complexity of many problems is increasing continuously and available time resources are becoming increasingly scarce. This also raises the importance of teamwork, since the requirements concerning imperative competences to fulfill the given task as well as the limited time resources can no longer be handled by a single individual. Increasingly complex setting of tasks in connection with increasingly scarce time resources available for their accomplishment predominantly determine the creative problem solution processes in the industrial economic sector today. Thus, the answer increasingly lies in successful group and/or teamwork. Organizations such as enterprises are more than just a group of individually acting single participants. Close interaction within working groups and teams, departments, profit centers, business premises, enterprises and beyond the enterprise's own borders is very important as is a cooperating network of stakeholders. Group achievement cannot be assumed to be the sum of individual achievements, rather it is determined by its own rules and needs different techniques for problem solving, and different forms of IQ and EI to provide for effective and innovative solutions towards sustainability.

Conclusions

Sustainable development is ultimately a highly complex challenge that requires purposeful actions based on a dynamic system of objectives. Single actors like companies and other interest groups need to build up a network.. Collaboration and inter-organizational partnering will become a critical success-factor for attaining the over all goal of sustainable development within a certain region. As discussed in this paper, for this purpose pure logical, analytically based problem solving alone is not an appropriate

approach, since it can only provide for new developments in a limited way. Sustainability itself is innovation and requires creativity and innovation in combination with the paradigms of logic

and determinism. It can be supported by dynamic creativity management which is not an alternative to traditional paradigms, but brings its best within synergetic interaction.

Notes

¹ This concept was as an initial draft first introduced by Gerald Steiner at the North Atlantic Economic Conference in Washington D.C. in October 2002 and at the STIQE-Conference in Maribor in June 2002.

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