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Multi-project-networks: A better way of implementing sustainable development ?   1

Multi-Project Networks: A better way of implementing sustainable development?

preliminary results

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1. Obstacles to the implementation of sustainable development

While world society is approaching Rio+10 the basic principles of sustainable development remain yet to be implemented. Current environmental risk is underrepresented in headlines and on agendas of the different governing bodies. The threats to humanity are largely ignored.[1] Still Scientists have presented a multitude of evidence for the existence of environmental problems such as the ozone layer depletion, global warming and a decline of biodiversity. Scientists have also come up with concepts such as eco-efficiency, dematerialization, industrial ecology, sustainable agriculture and service (instead of product) oriented industry promising solutions of todays and future environmental problems. After more than ten years of research pursued in different fields, and several successful implementations of the respective concepts in pilot projects[2], a wide consensus on the necessary direction of a development for sustainability exists. „It is clear that present economic activities should strive to conserve finite resources, respect ecological limits, harvest renewable resources sustainably, protect biodiversity, lower environmental emissions, reduce ecological degradation and take preventive action to avoid potentially irreversible environmental change."[3]

Why is change so difficult to achieve? The conception and implementation of sustainable development are tasks that demand an immense effort of all parties within society. In fact, it may be a task of such complexity, that it is impossible to solve at all.[4] In any case, todays efforts are producing only marginal improvements[5] and do not promise any reasonable success for the near future. They are by no means suitable for replication to the developing regions.[6]

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[1] Häberli et al. (2002: 25).

[2] Gas-efficient hypercars, zero-energy buildings, eco-textiles and zero-emission production processes (ZERI) are only some examples of available technologies.

[3] Jackson (2000: 199).

[4] Jackson (2000).

[5] The demand for mobility illustrates this fact - the industries answer to the demand of more environmentally friendly mobility services are more efficient cars or vehicles using other propellants than gasoline. The gains are more then offset by the rebound effect of increasing use of car and certainly do not solve the problem of traffic congestion and noise emissions caused by everyday commuter traffic.

[6] Meadows (2000) and for a recent summary on activities in Germany: UBA (2002).

A reason for this situation may be the limited horizon of relevant actors and the power structure within society. Producers optimize their production, but not the product life cycle. Consumers minimize prices, not total cost of ownership, and governments do not solve this problem by changing the cost structure because this would offend established industries in their respective countries. Finally, everybody blames the others and the general complexity of the problem.

It seems, as if the indeed existing complexity of the problem can hardly be communicated from one organization to the other or even to the individual. Apparently the understanding of the vast majority of decision makers is not developed far enough or is controlled by other criteria then those necessary to lead to a sustainable change in behavior. The impression remains, that neither the risk from current inertia nor the chances resulting from the use of more advanced technologies and institutions have been completely understood.

A plausible explanation for the lack of acceptance of the necessary change may be the stark contrast of the principles governing sustainable development and todays accepted growth paradigm. In this sense, sustainable development as a model and the necessary steps to achieve it have to be considered as innovations that are neither easily understood by individual nor by collective actors. More often than not their implementation is resisted because it would change the current balance of power. „Innovations are the discovery of new ways of doing things, ways that are not consistent with the collective memory. For a discovery to become an innovation, it has to become part of the collective memory.“[7] Modern systems theory uses the term „connectability“ to define an individual or social systems capacity to perceive and to process information (and act accordingly). In this context, sustainable development is *not* yet part of the collective memory. Connectability of sustainable developments efforts has yet to be created in order for them to be successful. A fact, that has not been taken into consideration in previous efforts.

The demanding nature of this challenge adds to the already complex corporate environment. These challenges can not successfully be met within organizations[8] nor when dealt with via the ideal spot market[9]. Instead, the cooperation of different actors from different backgrounds over a multitude of processes has been proposed as a possible solution. Project networks offer this integration capacity while also being able to overcome existing barriers to cooperation and barriers to learning. Properly managed they create rules of cooperation, enable the adjustment of the individual actors routines and allow for the development of trust.[10] Thus learning on the relationship as well as on the fact-level becomes possible.

As a consequence, strands of research from network theory and the field of organizational learning will be interwoven to a concept of a learning multi-project network dedicated to creating organizational intelligence for the implementation of sustainable development. A generic the learning cycle and its immanent barriers to learning is used to illustrate resistance to change. First findings from an existing project network are used to prove the feasibility of this concept. The presented analysis is based on the intensive screening of the projects documentation, on interviews with project members from different participating organizations and from the authors own experiences during project participation.

2. Concept, structure and process of project networks

Cooperation among organizations has long been a focus of organizational research. Cooperations are entered by one or more independent organizations[11] such as corporations, administrations, research institutions or

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[7] Eriksson et al. (1998: 346).

[8] Ortmann/Sydow (1999: 205).

[9] Spot-market exchange of goods is an ideal that is not suitable when goods and services are of a complexity that requires highly specific agreements. The higher the complexity, the higher the likelyhood, that either parties responsibilites can not be fully defined at the time the contract is closed. Market failure is also evident once public goods are used due to resulting positive and negative external effects.

[10] Sydow (2001)

[11] The focus is deliberately not set on firms, since inter-organizational projects do include more often than not partners other than corporations.

NGOs in order to supplement each others key competencies. It results in the accumulation of resources necessary to execute a required task. Cooperation is an efficient alternative to the autonomous development or acquisition of resources[12] when their development would be to costly, their acquisition is rejected for strategic reasons or simply impossible (as in the case of resources based on implicit knowledge).[13] Cooperations evolve on horizontal and/or vertical levels of business. The exchange of transactions is organized by the use of contracts that reach from[14] loose co-operations (without obligation) via contract cooperation to minority equity cooperation. Cooperation is generally perceived advantageous because it (1) reduces the individual participants risk, (2) creates access to otherwise unavailable resources and thus extends the individual resource base, (3) blocks competition, (4) overcomes trade and investment barriers and (5) facilitates (international) expansion of firms.

This positive assessment is balanced by several obstacles that exist in the process of creating cooperative agreements and several cooperations fail. The main problems are caused by the possible risk of know-how drain, future competition by todays partners, mistrust and limited future flexibility due to highly specialized cooperational settings. Also, a particularly insufficient interface design inhibits cooperation and the learning process within projects and project networks. The basic mean to overcome these obstacles is the creation and maintenance of a favorable framework characterized by a basis of „institutional-based trust" and by institutionalized cooperation-enabling steps such as network rules and routines. Independent partners, voluntarily joining the cooperation, sharing a common goal and being knowledgable on the expected benefits of the participation are beneficial characteristics of efficient and successful cooperation.

2.1 Characteristics of projects

In the middle of the 20th century, projects were used to deal with complex, time constraint tasks that needed a certain free-wheeling creativity to be solved.[15] They provided an extra-hierarchical environment, the flexible employment of (human) resources and a goal oriented team based cooperation necessary to control complex tasks.[16] „A project is a task, or the organization set up to accomplish a task, of creating a product within predetermined parameters"[17]. While many such definitions[18] exist, most of them share a defined set of *key-characteristics*[19], found to be important to differentiate the project from other activities in and between organizations. From an institutional perspective, projects are located outside common hierarchies to overcome the known hierarchical limitations and to (1) realize extraordinary tasks that require a certain creative potential. They (2) exist over a limited period of time. (3) Their content is defined as either a specific task or a desired result. (4) The task/goal is rather complex in nature its accomplishment is uncertain and connected to potential risk. They (5) integrate actors from different organizational backgrounds[20]

The term ‚project' describes the structure as well as the processes to accomplish the specific task/goal. Over time a huge body of literature developed dealing with and describing in great detail the different available project management tools.[21] Only recently has the aspect of projects as social systems gotten more

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[12] The term „resource" is understood as ownership or control of financial, human, relational sources necessary to execute the respective task.

[13] Hamel (1991) provides a different understanding, putting emphasis on cooperation as a learning race. The main goal within that kind of ‚cooperations' is the acquisition of knowledge providing an advantage over former partners once cooperation end. This approach neglects the regulating effects of reputation for trustworthyness and does not seam feasible in the long run.

[14] Grochla (1972: 5).

[15] The most prominent example is the NASA space program, a rather inglorious one is the war logistics of the United States including the development of the Nuclear bomb.

[16] Vetter/Wiesenbauer (1996: 51).

[17] Gilbert (1983: 189).

[18] Schindler (2000: 372f.).

[19] Madauss (2000: 516-529) and the quoted literature.

[20] Haberfellner (:col. 2090).

[21] Schindler (1999) gives an extensive overview of the body of literature.

attention.[22] This perspective opens the focus of analysis and shifts attention to the process of interaction among individual actors and the necessary steps to improve this cooperation. It requires a closer look at cultural and procedural aspects enabling efficient cooperation and learning processes. The existing „institutionalized termination"[23] at the end of each project leads to an insufficient development of time consuming social institutions such as trust and a collective memory[24]. Since these mechanisms are especially valuable to overcome problems related to complex and incompletely defined tasks, their creation can avoid conflicts within project cooperation and the incomplete learning in and from projects. The connection of projects in strategic networks takes these aspects into consideration.

2.2 A network definition

For more than a decade, networks as a new mode of coordinating business activities have gotten increasing attention. They have been found suitable to deal well with complex and rapidly changing environments.[25]

Dynamic networks[26] are recognized forms of coordination classified either as a distinctive form of organization[27] located between ideal modes of „spot market"[28] transactions and organizational hierarchies or as a hybrid form, combining market, hierarchy and community as social means of coordination[29]. They use a combination of each mechanism (price, fiat and trust) to achieve efficient results[30]. A network is characterized as a social system which (a) consists of at least two organizations who are coordinated through means of social relations, (b) provides a shared common identity and reflexively coordinates the conditions of system reproduction,[31] (c) maintains an exit option for the partners,[32] and (d) uses shared resources for the accomplishment of each projects goal.[33] Its flexibility is based on the resolution of conflict over the appropriate use
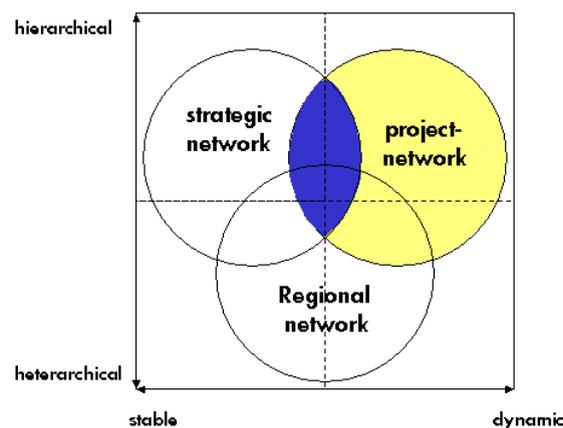

Figure 1: Types of networks
(source: modified from Sydow 1999: 287)

[22] Sydow/Windeler (1999: 215).
[21] Vetter/Wiesenbauer (1996: 51).
[23] Lundin/Söderholm (1995: 449).
[24] Willke (2001: 30).
[25] Sydow (1992) Hakansson/Jan (1993). Networks have for example been analysed in construction (Eccles 1981), in the insurance industry (Sydow 1994) in the film industry (Jones 1996, Windeler et al. 1999); in tourism networks (Halme 1999) and most recently in car manufacturing (Sydow 1999).
[26] Miles/Snow (1986: 62).
[27] Forsgren et al. (1995).
[28] Granovetter (1985).
[29] Wiesenthal (2000: 44).
[30] Williamson (1991) and Sydow (1992) for a detailed description of this position.
[31] See chapter 2.3 for the importance of shared rules and routines for the long term existence of organizations.
[32] Well (2001) and Sydow (1992).
[33] Osterloh/Frost (2000).

of common resources[34], on the balancing of power and trust[35], and on the integration of cooperative as well as competitive tendencies of its participants. When this balance can be successfully maintained, they are suitable for the accomplishment of complex, innovative tasks.[36]

From the network distinction by location of power (hierarchical – heterarchical) and by temporal duration (dynamic – stable) three generic types of networks result: the strategic network, lead by a single, focal corporation, the regional network, a stable form of cooperation without a defined hierarchy and a regional context and the project network. The project-based coordination of activities by a focal corporation within a network is defined as a project network.

2.3 Building networks of projects

Project networks – a new perspective

The term project network is not widely used in literature. Early research focussed on the rather technical description of tools and methods for the support of single projects. Only recently a multi-project perspective has gotten more attention focussing on the support of managing several projects within one company (the multi-project organization)[37]. An even more innovative approach identifies the need of an extremely flexible organization based entirely on projects (management by project[38]). An extension of this concept by intensive
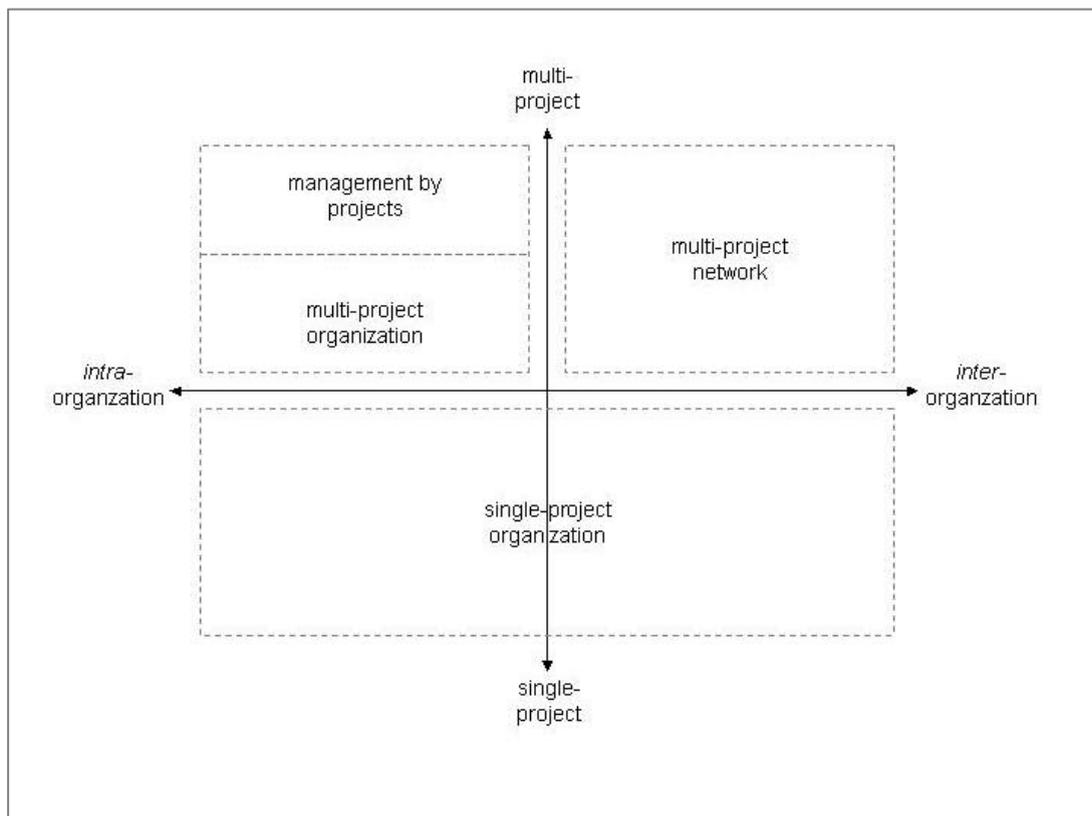

Figure 2: Distinctive types of project based forms of organization (source: own)

use of information technology and the integration of several actors outside the single cooperation finally leads to the ad-hoc coordination of projects within virtual organizations.[39] The presented concept of project network steps back from such forms of auto-configuring networks and replaces their configuration „automa-

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[34] Osterloh/Weibel (1999).
[35] Bachmann/Lane (2001).
[36] Miles/Snow (1986).
[37] Gilbert (1983).
[38] Garais (1997).
[39] Scholz (1994) and Picot/Reichwald (1998).

tism" with the focal organization as an efficient coordinating body. It follows the demand for *changed organization systems*[40]. It overcomes organizational boundaries by connecting partners from different organizational systems and cultures, and integrating their work packages to a deliverable project result.

The structure of strategic multi-project networks

A multi-project-network is an organizational shape among legally independent, economically more or less dependant organizations created to execute more than one project. It is characterized by an intertwined structure intra- and inter-temporally connecting (1) a *network of actors* within each project and a (2) strategic *network of projects* supported by the *focal organization*.

The network of actors consist of several project members from different organizations forming the project value chain. Each of them provides one or more competencies necessary for the successful accomplishment of the project. With regard to their activity status, three types of organizations exist within this landscape of project-networks:

1   organizations which are in the process of joint project execution (activated organizations),
2   organizations which have worked together already and did finish a project together (members of the network pool),
3   organizations which have not been working together before, but are suitable and interested to enter the project network (potential pool members).

The first two are connected through relatively strong ties, since they either actively share cooperation experience or have a history of finished projects within the project network. They acquired cooperation experience in the network, adjusted their different frames of reference and have an impression on the trustworthiness of each other in a certain context. This cooperative experience is an investment that can successfully be used in future cooperation. The third group of organizations is of interest to the network or is interested
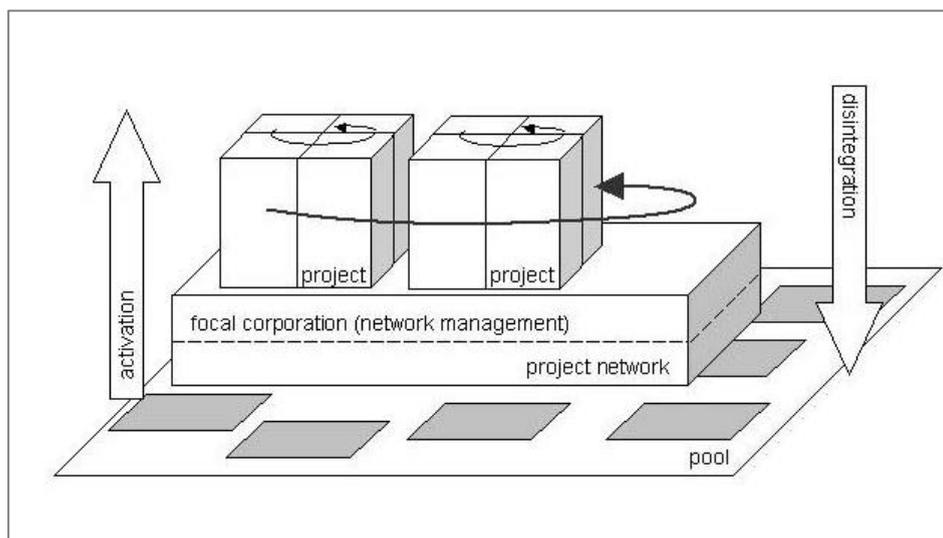

Figure 3: The strategic multi-project network (source: own)

in participating in the network due to its distinctive resource endowment. Its future participation either provides a currently available competence more efficiently or provides new competence and innovative insights the network via future projects. This group comprises potential participants connected to the project network via weak ties. Members of group two and three form the pool[41] from which new projects are formed and subsequently are executed[42], providing links to the outside of the network through which new ideas and new partners can enter.

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[40] Hastings (1995: 260).
[41] Sydow/Windeler (1999: 230).
[42] Weber (1996: 138) and Sydow/Windeler (1999: 222).

The network of projects is created around a common goal, for example construction, production of movie content or creation of innovative insurance products. This common goal leads to similar competence requirements of the individual projects. Thus, the participating organizations are largely the same, with a replacement and/or addition of individual actors from case to case.

The focal organization manages the network. It is connected to the active actors and to the pool members alike. It acts on the network as well as on the project level strategically leading the network, providing continuity and structure, and enabling learning.

Strategic network management as a task of the focal corporation

Empirical studies do show, that in most types of successful strategic networks coordination is done by an individual/a corporation and not left to chance.[43] This focal organization has at least a minimum of power to settle disputes over the requirements of common resource provision and its use, as well as to distribute gains and losses from their employment. It defines the network goal and strategically guides its development. On a global level, the focal corporation is responsible for the management of the network. It screens the envrionment for potential projects and potential organizational partners, cultivates relations to former and current project participants, and thus maintains the networks assimilative capacity for new developments. The successful execution of several projects from the networks project portfolio creates valuable knowledge and contributes to the reputation of the network and its members in a certain field of activities. The network gains publicity and credibility and Institutional trust as a major prerequisite for connectability of actors from different backgrounds develops.[44] The attractiveness of the network for new partnes and the potential of new projects increases.

On a detailed level, the focal organization defines (1) project goals and milestones, (2) general communication interfaces such as rules for the creation, exchange, and acceptance of documents, and (3) mechanisms to sanction inappropriate behaviour of the projects actors. They are prerequisites for the extended project execution cycle including the preparation, the execution and the disintegration of each project.

The preparation phase consists of several steps to identify and select suitable projects, to align existing with required skills and to subsequently identify and select project partners. Once the partners have agreed to cooperate, a framework for cooperation has to be established. This is especially important, since the actors come from different individual, organizational and industry backgrounds. On the one hand, this is a considerable advantage for the execution of complex tasks since it allows for the interpretation of the challenges at hand by actors from different backgrounds. On the other hand, it is a considerable risk. Projects, like all organizations are interpretative systems whose perception and interpretation of the internal and external project envi-
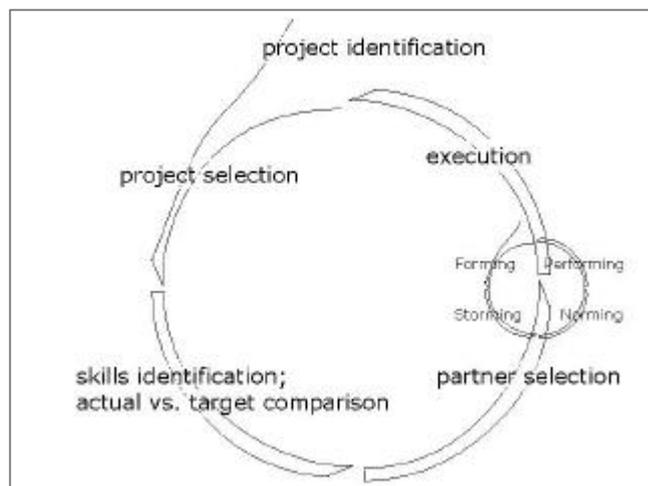

Figure 4: The network management process (source: own)

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[43] Lorenzoni/Baden-Fuller (1995).
[44] Sydow/Windeler (1999: p. 220-223 and p. 227).

ronment varies considerably.[45] This variance can be explained by differences in individual and organizational habits, beliefs, cause maps, assumptions and values.[46] These routines exist in explicit and implicit form. Explicit routines are documented standard operating procedures, forms, process descriptions and the like and are easy to transfer. Implicit representations are much more difficult to communicate and are sometimes not explicable at all. They are shared by common experiences (socialization). To enable meaningful communication within and outside the network at least a minimum of understanding of these differences has to be achieved. The development of a shared construct of reality forms the cultural dimension of the projects and the network and provides the background for the development of trust and the possibility of asymmetric action (direct reciprocity). A failure to reach this degree of understanding leads most likely to failed projects.

Therefore, personal and technical communication interfaces on the project level such as interpersonal working groups, connectable information-systems as well as rules and regulations for cooperation and agreements on the transfer of knowledge during the project and after its completion have to be set. They are partly introduced to the project by the focal corporation and partly result from the groups forming process during the norming phase[47]. When working together, norms and values influencing the actors actions can be contradictory. Misunderstanding and potential conflict arise. Continuing cooperation leads to the construction of a project-based set of norms and values, of formal and informal rules of communication and cooperation and enables a successful accomplishment of each project. The resulting institutions are complemented by generally accepted project goals and by defined contributions of the individual actor. Lastly, sanctions applicable in case of resource abuse or missed goals have to be defined.

These institutions form the basis for trusting relations as they reduce the risk of the abuse of one or more participants contributions. Over the course of the project they are permanently created and recreated in response to project related experiences. They „translate" individual actions to make them understandable to the respective others and establish connectability of action.[48] A collective pool of shared social meaning is the most fundamental prerequisite of successful social – project and network – interaction.[49]

Not only do shared rules and routines ease cooperation, but they also enable learning since communication patterns are established and the exchange of information is common and new knowledge can change existing individual and organizational constructions of reality. As opposed to the positive impact of shared frames of reference, the same institutions can also block change and inhibit learning.

3. Multi-project networks – learning tools for sustainable development

Learning takes place on the individual level. Combined individual learning can result in small-group and organizational learning. Within organizations learning and the existence of an organizational memory are both quiet „independent of any specific individual but not independent of all individuals".[50] „Organizational learning is viewed as routine based, history dependant, and target-oriented".[51] On a further aggregation level whole societies learn and underlying assumptions like democracy, market economy, human rights emergence. They, in turn, influence the behaviour of systems within society.

The learning cycle by March and Olsen is used to illustrate learning steps on the individual and the organizational level as well as to outline where learning barriers limited the improvement of the knowledge base.[52]

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[45] Walsh/Ungson (1991: 60).
[46] Walsh/Ungson (1991: 63).
[47] See figure and compare Kowitz/Knuston(1990).
[48] Bachmann/Lane (2001: 83).
[49] Gulati (1999) finds a positive correlation between network experience and the likelyhood of participation in another network.
[50] Kim(1993: 37), Starkey (1996: 2).
[51] Levitt/March (1988: 319).
[52] March/Olsen (1976).

3.1 Learning and obstacles to learning

Data is created by observation and depends on the observers individual perspective as well as its resource endowment for observation[53]. Information is drawn from data when perceived as relevant according to individual/group criteria for relevancy. Knowledge develops from the interpretation of information and from its integration within the individual context of experiences.

Knowledge exists in an explicit, codable and a tacit, hidden form.[54] While explicit knowledge can be transferred and represents data to everyone but the sender, tacit knowledge is difficult to transfer at all and may even be inexplicable to the owner.[55] Nonaka identifies the process of learning as either socialization or internalization while the transfer of data[56] takes place in socialization or combination processes.[57] It is obvious, that learning and the transfer of data are highly dependant on the context in which this processes take place.

On the individual level, learning takes place, when information is integrated into the individuals set of beliefs (which may make unlearning necessary) and further influences the individuals actions. On the organizational level „learning is the process of changing the organizational knowledge base, the improvement of its problem solving capacity und its action capacity as well as the change of the organizational frame of reference for and by its members."[58] It changes the organizational routines[59] and includes the acquisition, the development and the distribution of knowledge. The very existence of these routines is a key factor for barriers to learning.

March and Olson present a generic learning cycle. Individuals learn based on experience.[60] Organizational learning takes place as the result of an aggregation of dynamic social processes.[61] Within this cycle, individual beliefs influence individual action. Individual action shapes organizational action which in turn has impacts on the environment. These impacts are observed by the individual actors and interpreted as root-cause relations. Differences between desired and actual state of the environment in response to organizational action are recognized as problems and form the basis for further action (and learning). Individuals and corporations are generally and permanently open to learning from the environment. Past experiences influence individual and organizational routines and thus influence learning.

This ideal learning cycle can be disturbed in several ways.[62]

1   Role-constrained experiential learning: The influence of individual beliefs on individual action is limited by the fact that individual attitudes are not directly matched by individual performance. Also the influence of individual beliefs on individual action is partially overruled by organizational rules and routines and by anticipated organizational inertia.

2   Audience experiential learning: Individual action has little or no effect on organizational action. The organization excludes itself from the opportunity to learn from its individual actors. Either individuals lack the access to the decision making process within the organization or the organization resists change due to the current power balance and/or defensive routines.[63]

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[53] The are highly dependant on individual ideas, concepts, prejudices, ideologies opinions - in short, the individual background. Willke (2001: 9-18).

[54] Polanyi (1958).

[55] „We know more than we know how to say" Polanyi (1958: 12).

[56] According to these definitions, nothing but data can be transferred between individuals. Only the selection of data creates individual information and the integration of information into a set of past experiences results in knowledge. Whenever the term knowledge transfer is used here, this more complex process is assumed to take place.

[57] Nonaka (1994).

[58] Probst/Büchel (1998: 17).

[59] „The generic term ‚routines' includes the forms, rules, procedures, conventions, strategies, and technologies around which organizations are constructed and through which they operate. " Levitt/March (1988: 320).

[60] March/Olsen (1979).

[61] Schreyögg/Noss (1995).

[62] March/Olsen (1979: 22 and 56-58).

[63] Argyris (1990).

3   Superstitious experiential learning: The cause-effect relation between organizational action and environmental response is broken. Although organizational action has no or little effect on the environment, this relation is assumed to be existing or the relationship is constructed retrospectively. The gross overestimation of the organizations influence on its environment has to be attributed to the individual and rather belongs to the following barrier.[64] From the perspective of organizations being individual actors within society, this learning barrier can be understood as ignorance of organizational action on the level of society. A single organization can not, due to rules and routines as well as due to defensive patterns, influence the development of society. Broken down to the relation individual (as the representing actor for an organization) vs. organization (represented by other individuals) this pattern can be explained by barriers 1, 2 and 4.

4   Experiential learning under ambiguity: In a complex world with unclear and ambiguous environmental events relevant developments have to be identified, observed and interpreted. The vast number of non-linear cause-effect relations makes this a challenges for the individual actor. False individual beliefs, misguiding organizational routines and collective perception barriers are possible results of a failure in dealing with this task appropriately and correctly. The interpretative quality of the single individual depends on the degree of integration into the organization and on the inter-individual connectedness to other organization members.

Consequently, perception, liking and expectation are important individual processes influencing the successful learning under ambiguity. These processes are influenced by interaction patterns and trust. The need to unlearn may be an important obstacle underlying the four barriers to learning. It requires a reinterpretation of events or even a change in perception of reality. Individuals are typically hesitant to give up their existing interpretation of reality and use individual defensive routines as well as a creative interpretation of organizational rules and routines to avoid change.[65]

Most of these learning disabilities are rooted in a clash of different realities. Individuals are limited in their recognizing capacities and also limit their perception because they see only what the want to see, ideas that do not fit with the individual or group reality are not recognized as valid.[66] A fact largely influenced by organizational micro-politics and power games.

The presented learning cycle and its immanent learning barriers provide a close system to explain the process of learning and its limitations. The concept has been critiqued as mechanistic itself and ignorant of other forms of learning[67] than experience learning. The limitation to the individual actor is not perceived as a limitation for its further use in explaining learning within project networks. Success and failure of organizational action can be attributed to the connectability of individual action to organizational and societal routines. The model does not only provide this link but leads a focus on the barriers to learning and to continuous improvement. It is consequently used to analyze learning in strategic multi-project networks.

Independent of organizational structure, learning much like cooperation can not be forced. It needs flexible, open minded participants willing to reassess their opinion explanatory character compared to other opinions and to environmental changes.[68] Only then can individuals from different background develop a shared set of norms and values that allows for the meaningful exchange of data and for the linking of different frames of reference. Co-operation with each other and learning from another is enabled.

3.2 Learning multi-project networks

In strategic multi-project networks learning processes exist on the project-level and on the strategic network level. Both levels are interconnected and iteratively altered by the flow of knowledge between them.

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[64] Wiegand (1996: 189).
[65] Argyris/Schön (1978).
[66] Senge (1994), Dörner (1989: 288-294), Watzlawick 1976, Willke (2001).
[67] Mainly all forms of indirect and simulated learning, which by themselves have their own limitations.
[68] Probst/Büchel (1998: 127).

Learning on the project level is taking place within each project. According to the definition of learning[69] it takes place when the projects learning base and its shared frame of reference are changed and its problem solving capacity increases. It can thus connect to other frames of reference and integrate relevant knowledge. Learning is impaired, when this change is prevented from taking place.

A project therefore learns from several sources. First and foremost it learns from its participants. Initially, they learn from each other when adjusting their individual backgrounds and adapting to the networks predefined rules, frames of reference, and communication structures. They in turn influence the shared institutions according to their own frames of reference and introducing new or altered ideas to the project level. Project learning happens on the personal level via socialization and recombination or from recorded experience via internalization. Change is triggered either convincing the other project members of its usefulness or simply by forcing it to happen using individual power and ultimately change the actions of the project. Indirectly the project may learn due to the employment of structures pre-installed by the focal corporation. Tales of individual experiences as well as documented rules and regulations from the „networks memory" may contradict those of the participants. Learning takes place when their influence leads to a change of action on the project level. Lastly, the project may learn from the environment whenever project action does not lead to the required result and starts another learning.

Learning happens on the level of the strategic network due to knowledge appropriated from the different projects. Since context and data are recorded, factual and process related knowledge are transferred. Project results and underlying processes have to be analysed. Convincing as well as disappointing solutions or results challenge previously stored ones, and may finally lead to change. New rules and routines, updated factual knowledge and an adapted perspective on the network environment increases the connectability of the strategic network to future changes due to its broadened communication channel and improves the efficiency of future cooperation.

On the network level this results in a changing network management. Projects and partners are selected according to slightly different criteria, rules and routines are adapted to new demands and sanctioning mechanisms are altered. Maybe event the focus of the network is changed. Also the changes are re-transferred to the project level via altered institutions, influencing the execution of future projects.

4. Water supply for Milos – The case of a sustainability oriented project network

The Gerling Sustainable Development Project GmbH (GSDP) is a project development company founded and owned by the Gerling Insurance Group, based in Cologne, Germany. Its aim is the development of innovative solutions to 21st century problems integrating sustainable development principles to create true win-win solutions. At the same time, these activities are supposed to support the development of new markets for the Gerling Group. The author is part of the project group for the development of a geothermal driven desalination unit on the island of Milos. The project will be described with a focus on learning and unlearning of individual actors as well as of the project team. Since the importance of knowledge appropriation has been stressed, the micro-article as a tool to document status and context of a projects success is proposed and illustrated.

4.1 Project description

As water scarcity is one of todays most pressing problems, GSDP decided to include the search for possible solutions into its portfolio of projects. The Greek island of Milos was chosen as a prime example for pressing water problems in extreme geographic locations. With its roughly 5,000 permanent inhabitants, and about 85,000 summer tourists the island`s demand for fresh water is constantly exceeding its natural supply base. The water shortage is getting even more critical due to the increasing number of tourists and due to the

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[69] Cf. 3.1.

demand by local extractive industries. Current supply is partly sourced from (mostly illegal) drilling wells as well as from bottled water. As a result, all parties have to deal with a limited supply of water, usually at a quality well below their respective requirements and at high cost.

From an environmental perspective, the overuse of the small groundwater reservoir leads to decreased reservoir levels and a subsequent intake of seawater. As well, the vast amount of plastic bottles used to transport drinking water to Milos creates a considerable waste problem.

In order to improve this situation, the different parties first had to be convinced, that a change from the current water supply system to a new one based on the use of renewable energy would prove to be beneficial and would provide long term economic, ecologic and social advantages to the island. GSDP succeeded in bringing all the relevant parties together to address these problems and to convince them of the feasibility of the envisaged solution. In addition to the production of high quality water the project entails a modul covering the installation of heating and cooling systems. This does not only allow for a highly efficient use of the geothermal plant, but does also limit the amount of excavations necessary for the new infrastructure to a minimum. The amount of fossil fuel needed for heating and cooling today as well as for the transport of water to Milos is significantly reduced and results in an improved environmental quality.

To guarantee an effective operation and management of the plant upon its completion, GSDP founded a privately based company – Milos SA – to take over the planning, construction, owning, and operating the installations (build, own, operate). It will sell the desalinized water at a price of about 2 €/m3 (US $1.8) compared to an average current price of 395 €/m3 (US $ 356) for high quality bottled water. Therefore the total cost for water on Milos will decrease. The saved money can be used for other purposes increasing the overall quality of life on Milos.

These innovations should bring several benefits to Milos:
1   Tab water will be usable as drinking water (replacement of plastic bottles)
2   Tab water can be used for irrigation (less water from wells necessary ?   Groundwater levels should be able to recover over time)
3   Tab water is less aggressive (dishwashers, washing machines etc. suffer less from erosion ?   decreasing maintenance cost)
4   Reduced total cost of water supply
5   The production and maintenance of the new water supply system creates itself about five qualified jobs. Spill over effects to other industries such as tourism and agriculture are likely.
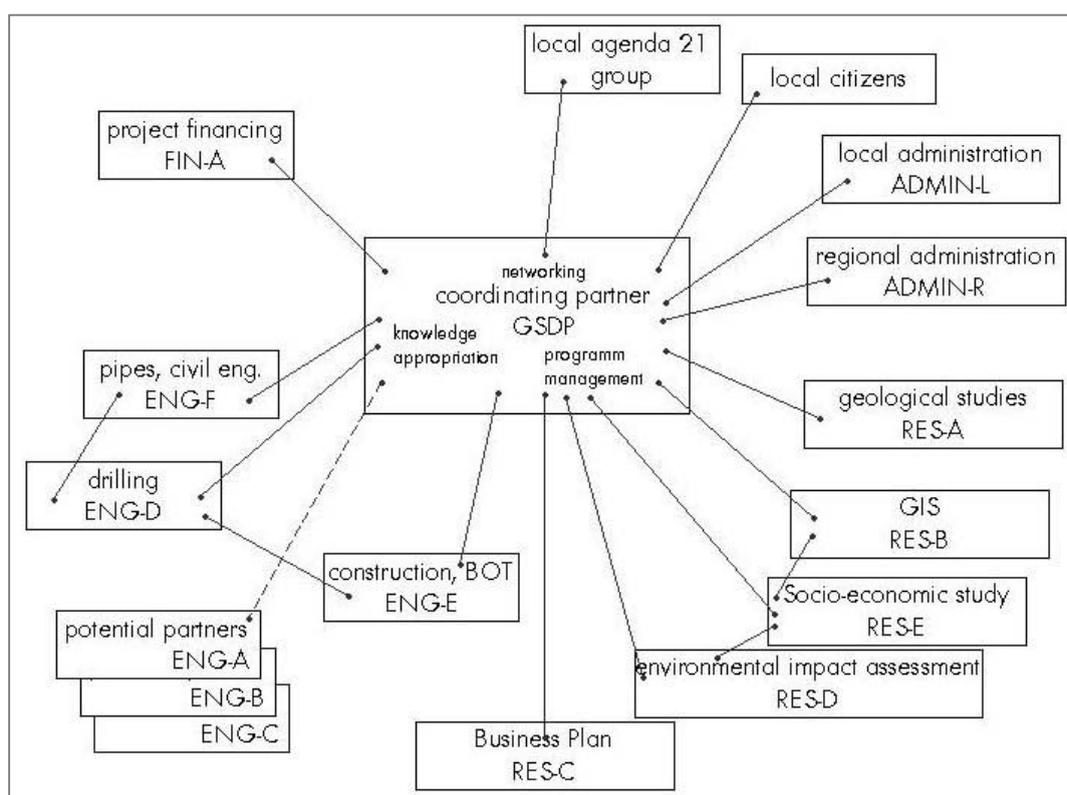

Figure 5: The project network (source: own)

The Milos project is innovative because it combines different technologies in an energy efficient and cost effective way. GSDP plans to replicate the project on at least four other islands in the region. These projects will start with the production of drinking water and then move on to warm water and energy production. The new projects should benefit from the experience and contacts gained on Milos. Several areas in the Mediterranean, and elsewhere, lack fresh water and have geothermal energy possibilities. They are possible locations for the employment of the innovative technology that is being developed and tested within this project.

4.2 Project and network development

After the project had been chosen and was selected as being suitable according to sustainability requirements, it was started in 1999. GSDP defined the competencies necessary to accomplish the ambitious goal of providing water to Milos using abundant geothermal energy and identified possible partner organizations. They were approached and asked for their interest in participating. From this group a first network consisting of GSDP, research partners (RES-A, RES-B, RES-C), an engineering company (ENG-A) and the local administration (ADMIN-L) was formed. At this stage cooperation was rather loose, based on informal agreements and letters of intent. Still, participants like GSDP itself, RES-A, RES-B and RES-C provided considerable input and met frequently to sketch a path for further development. A first business plan and a GANTT chart were drafted to further illustrate the project to potential participants. Different technology partners (ENG-B, ENG-C) for the design and construction of facilities as well as for test- and production-drillings were approached. ENG-B showed interest and even proposed to become a stakeholder in the planned MILOS SA but turned down the offer when asked to sign a written agreement. Thus no agreement for participation could be reached. RES-E was approached to design and conduct a scientific socio-economic study on the quality of life and water consumption patterns on Milos.

In parallel financing options were checked and although an investor could not be found at this early stage of the project, GSDP successfully approached European communities energy directorate (DG TREN) and received a non-refundable grant of 33% of project cost. This grant made it necessary to further define who would participate in network. Consequently a next step of formalization was a binding agreement including a monetary share to fund the further development of the project. ENG-A was not willing to sign this commitment and left the network. As it turned out, this partner was not capable of fulfilling the share of the projects task he had up-front promised to deliver. It was then decided to re-divide the different tasks. No new partner was approached at this time. The further development was largely driven by GSDP, RES-A and ADMIN-L.

Since the necessary licenses to start test drilling were granted by the regional administration (ADMIN-R) one of its representatives was approached and integrated into the process. During the beauty contest organized by ADMIN-R to screen possible applicants for the drilling rights ENG-C handed in its own application, apparently abusing the information previously obtained under a non-disclosure agreement. Unfortunately, this fact could not be proved. Although the license was granted to ENG-C, GSDPs excellent contacts to ADMIN-C revealed the fact, that Greek law granted local administration the prerogative to the use of its own resources. The establishment of MILOS SA with ADMIN-C as major stakeholder made it possible to obtain the drilling rights and to exclude ENG-C from the process.

As the most recent step, additional financing options for the project were explored and a bank (FIN-A) as well as a construction company (ENG-E) experienced in BOT-projects were approached and a possible sub-contractor (ENG-D) for the drillings was identified and included in the network. As sustainable regional development is part of the projects set of goals, a local agenda 21 initiative (LOCAL) will be part of the network. For further assessment of technical and social feasibility identified the need for a reservoir engineering study, for a an environmental impact assessment and for a social impact study. The relevant data from these studies will be integrated into a Geographic information system illustrating the spatial project setup. The respective partners (RES-B: GIS, RES-D: EIA, RES-E: Social Impact Assessment).

As result from these activities, all position in the project value chain are filled, a preliminary study provided by RES-A shows considerable geothermal potential for the region, MILOS SA has been established and the project benefits from strong local interest and support.

4.3 Main learning steps

Experiences made in the project have to be recorded for archiving and later use. This should not only done after the completion of a project but also at other, defined steps such as milestones during project execution. The micro-article[70] is a suitable tool to routinely collect knowledge within each project. It should collect facts and figures as well as the context in which they appear. Its storage in a network-wide information system enables the transfer of experiences from one project to another. It reflects active communities of practice and enables the learning of project participants from these experiences.

The micro-article will be used for a preliminary assessment of the Milos project illustrating its current status, the achieved learning steps, and the encountered barriers to learning (compare 3.1). For this analysis, it is taken for granted, that a participation in the project will increase the potential partners future solving capacity not only because they expose themselves to a new and innovative way of doing business but also because they benefit from the publicity of the network.

The development of cooperative knowledge within a project network

Story

The project on Milos is special to GSDP as a focal corporation, since it is the first project in the Eastern Mediterranean. It started when one of GSDPs project managers, who had previously heard of the potential of geothermal energy, recognized its potential on Milos. GSDP benefited from this individual, but could not benefit from any previously acquired experience on the organizational level. Contacts and partners had to be found, communication and cooperation structures had to be established and a common goal, ie. sustainable water provision for mediterranean island, had to be communicated.

1   Different stakeholders have to be identified and have to be integrated into the project.
2   Their interests have to be aligned with the project goal.
3   The project is innovative, no reputation of GSDP for this kind of project is available, financial needs for the project are not yet covered.

Learning steps

• Interviews with project participants and the project leader show their high involvement and their motivation to be able to work according to their beliefs (step 1)
• GSDPs (step 4/1) early start to integrate the local community is of exceptional value because misinterpretation of GSDPs influence was avoided and the resulting contacts are still useful when problems at this level occur.
• The content of the project was very well presented to different potential partners due to the activities of the project manager (step 1). Back-up by business plan and related information material. (Tools to interpret the environment)
• Openness in approaching potential project partners (although this proved to be the source of a major problem in the current project) necessary for gaining information for the focal company and for the projects. Enabled GSDP to increase its specific knowledge on sustainable water production (step 2) and lead to a reputation as a honest partner (outside view! – step 3) The competence to promote innovative projects has greatly increased (learning by doing, better understanding of cause effect relations – step 3/4)
• A network of contacts was established is available for future activities (step 4)

Learning barriers

• Pure role constraint learning (barrier 1) could not be observed from the data available.

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[70] Willke (2001: 107-124).

- A mix of role constraint and audience learning (barriers 1/2) however was observable. An engineer from ENG-A was convinced of the feasibility of the concept, but could not change the hesitant and finally negative attitude of his organization. This was obvious for a second time, when a group-manager of ENG-B even signed a preliminary letter of understanding and later had to withdraw his commitment to a lack of authorization and support by his board. From a different perspective, RES-E initially designed a study that did not fulfill the projects needs. Only after several attempts did GSDPs project manager succeeded overcoming this barrier and made them comply with their contract.
- Superstitious learning (barrier 3) occurred within the relation GSDP – ADMIN-R. Although the final presentation of the project in the licensing process was perceived as success, the license was granted to the other applicant. The cause-effect relation had been misinterpreted. This type of learning barrier was sometimes in the cases, where activities during preparation and initial project phases failed. The influence of GSDP on its environment (ie. with regard to convincing partner to join the network, getting partners to do what was expected etc.) had been overestimated.
- Experiential learning under ambiguity (barrier 4) happened more often and more obvious. GSDPs management board resisted to accept the fact, that financial support was a key success factor for this project. Due to this fact, previously defined milestones were missed.

Areas for improvement

- Project financing is key for the speed of the project. From the start liquidity is needed to reach critical milestones. Its absence puts the time-frame at risk.
- A project risks are highly dependant on the cultural environment and have to be assessed more thoroughly with regard to possible abuse of information by approached partners.
- At the outset, not enough technical knowledge about the task was available. This information deficit leads to the classic information dilemma.
- Early identification of possible collision with stakeholders is paramount. All kinds of government (embassy, secretaries of state, mayor etc.) and non-governmental organizations should be used to communicate the project. This is especially necessary for SD-projects with a wide focus. Feedback can be used to identify additional communication needs. The main questions are „Who can help? Who can use his influence to overcome inertia and uneducated resistance? How can we avoid the abuse of the communicated information?"[71]

Sustainable development dimensions

On the economic dimension, the project will lead to long term overall reductions of water production cost for the community of Milos. The use of geothermal energy for the production of water and energy is a strategic option for the participating corporations. It represents a systems innovation and can be multiplied to different islands in the mediterranean and beyond. The planned provision of of heating services for the urban areas on Milos is an idea that first appeared during planning process. It provides additional strategic potential for market development. Lastly, the participating organizations benefit from the reputation of the network and from the fact, that they participate in such an innovative project.

From an ecologic perspective, the project saves a considerable amount of fossil fuels directly used to heat and cool buildings on Milos and to transport water to the island. It has the potential to reduce the amount of waste since it nearly completely replaces the plastic bottles currently used for water supply. In the long run, ground water levels will be able to recover.

With regard to the social dimension, the project produces direct employment. Heating and high-quality drinking water are available in individual homes. The water can be used for irrigation and enables an increased self-supply of the island when used for agricultural purposes. This offers development possibilities to an area characterized by rural exodus.

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71 Interview with senior project manager.

General recommendations

- From an system-learning point of view, intensive communication informs and „educates" stakeholders, it broadens their view and allows for a better understanding (and support) of the project. Communication activities prepare the ground for a link-up of individual and social memories to new, innovative approaches.
- Better lobbying is necessary. The project has to be visible for authorities strongly stating the advantages for the local people and the region. Message to stakeholders: Initial higher investments pay off, overall cost for a systematic sustainable approach based on renewable energy are lower than non-renewable-energy based approaches, still being profitable.
- The project is a good example for a possible win-win-win situation when using existing technologies innovatively and thus supports the implementation of sustainable development.

5. Conclusion

After nearly three years of project development first insights from the Milos project can be summarized. The project started out with the goal of a sustainability oriented closed systems development.

Although some obstacles occurred in the process, the network approach is suitable to deal successfully with the implementation of a concept as complex as sustainable development. The necessary information was transferred to the stakeholders and especially the local administration and the citizens were convinced of the feasibility of this approach. The focal organization integrated all necessary functions towards a project value chain. Initial learning on the network, on the cooperation and on the task level did take place.

Still, there is room for improvement. The duration necessary for the preparation of a project of this scale and scope has been greatly underestimated. As well, the risk of the abuse of information during network preparation period will have to be better assured against in future projects – especially, since such an approach by outside competitors can put the whole projects success at risk. It remains to be assessed, how a future project can make use of the gained insights.

The introductory remarks came to the conclusion, that sustainable development is a concept that has to be communicated to appeal. From a learning perspective, a common understanding has to be reached on the prerequisites, the complexity and the consequences of its implementation. On the project level, this goal has partially been reached. The implementation of Sustainable development was included in the projects goal and could be transmitted to many (not all) of the project members who found the underlying holistic approach a valuable enlargement of their business perspective. From a social perspective, the water supply for Milos was created with the vision of an improved quality of life for the inhabitants in mind. The resulting development was envisaged as in line with the natural carrying capacity of the island as a closed system. In contradiction to this vision, the inhabitants interpretation of future usage scenarios entails a new airport, more hotels, more facilities and finally more tourists. Their visions are rather short-term and largely ignore the carrying capacity of the island and the stability of its eco-system. Their view reflects an attachment to the currently dominant and much critiqued growth paradigm. Although this fact can be regarded as a failure of the project, it is also the starting ground for future projects. The successful outcome of the first project created a positive reputation of the focal corporation as a trustworthy partner and entails the option of more projects to follow. Their goal has to be wider and can not only include a sustainable systems management[72] but also a the continuous effort to convince people of the viability of sustainable development.

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[72] See McCormick (1998: 6-7) for the basics of ecosystem management.

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