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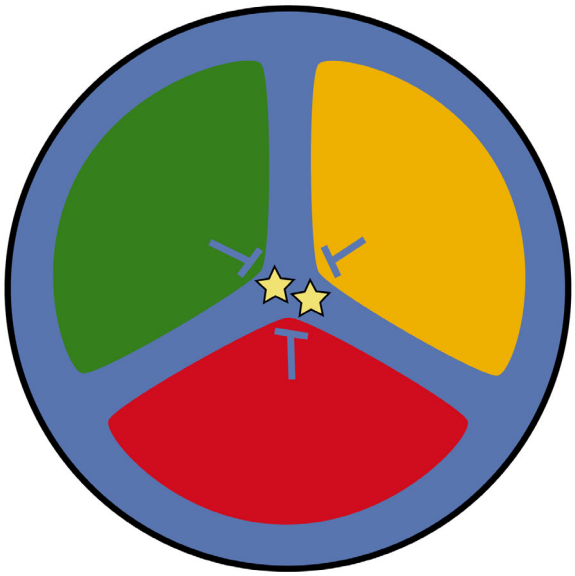
# Pro Evolution



## SUSTAINABLE MANAGEMENT IN VIRTUAL ENTERPRISES

## With the pilot scheme MAKAvAVirtual

**Diplomarbeit zur Erlangung des akademischen Grades eines**
**Diplomingenieurs für Internettechnik und -management (FH)**

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# A. TABLE OF CONTENTS

# B. INTRODUCTION

## 1. Abstract

Natural evolution is the changing in systems to adapt to environmental changes and it is enabled by the structural learning coupling between the systems. The structural coupling between the economic-, social- and ecological system, however, is not strong enough, because it seems that the overall system of “life on planet Earth” is not sustainable in the long-term.

To strengthen the structural coupling between the economic-, social- and ecological systems a man-made structural learning coupling could be implemented. This additonal structural coupling could be enabled by the new information and communication technology. The evolution that is, as a result, enabled by the information and communication technology is called Pro Evolution in this thesis.

The Internet could deliver a world-wide structural learning coupling on an information and communication basis. On this medium the systems could be represented by various different users. The users now could change information and communicate with the aim to find interdisciplinary solutions that support a positive evolution for mankind. Those sustainable solutions could then be realized in projects and could support a sustainable development.

The users may likely be autonomous and independent and as a result manage their parts of the projects alone and self-organized. Due to the Internet however the users could coordinate their work in a decentralized way. What could give them the direction for their work anyway would be the binding mission statement of sustainable management.

Everybody may participate in the projects like individuals, institutions or enterprises. If a product or service is created in the project it can be called a virtual enterprise.

Finally in this thesis an example is shown where *sustainable management in virtual enterprises* has been implemented for a small enterprise.

# 2. Structure and target groups

The chapters about "**introducing *virtual***" give an insight to the concept of virtual organizations and enterprises. It can be interesting for people who want to get an overview of those concepts (see C.).

At the beginning of the chapter about **virtual enterprises** the concept of the atypical virtual enterprise is introduced. It gives an overview of this kind of project organization (see D.1).

The actual starting point of the thesis is the **economic dimension.** The centre of attention is laid on small and medium sized enterprises and concerned economics may be interested in the *virtual* strategy (see D.2).

The chapters about the **technical dimension** of virtual enterprises may be interesting for computer specialists but also for people who look for ways to organize decentralized partners in a cost effective way (see D.3).

The chapters about the **social dimension** of virtual enterprises points out the new management challenges concerning virtual enterprises. This part may be interesting for managers and employees who are concerned about the social effects of virtual structures (see D.4).

After the theoretical part about the virtual enterprise the idea of sustainability is introduced. In the following chapters a concept is created step by step which combines the idea of the functional **sustainable management** with that of the virtual enterprises. These chapters can be interesting for all those who are interested in first results of this thesis (see E.1-4).

The chapters about **Pro Evolution** show that the theory of this thesis can be regarded as being in the position to change the structural patterns towards the vision of sustainability. In this thesis I call this process Pro Evolution. These insights can be interesting for visionaries and/or scientists or other interested people (see F.).

The last chapters of this thesis deal with the virtual organization **MAKAvAVirtual** which has implemented *sustainable management in virtual enterprises*. It shows how the different possibilities outlined in the previous chapters have been realized in the first step (see G.1-4).

# 3. Diploma thesis

The diploma thesis is related to virtual enterprises, small and medium sized enterprises, open source software, sustainable management and the evolution. It is divided into the following parts which together form the diploma thesis:

1) ***Virtual enterprises can support small and medium sized enterprises to dynamically include decentralized competences for innovative project missions.***

2) ***Open source software in combination with the Internet can provide the technical basis for virtual enterprises at relative low cost.***

3) ***The partners in virtual enterprises work self-organized and a mission statement that delivers shared values for them makes the cooperation less risky.***

4) ***If sustainable management is the mission statement of virtual enterprises then sustainable development is being supported.***

5) ***Sustainable management in virtual enterprises is Pro Evolution.***

If one looks at the diploma thesis above one can find that it has an economic, a technical, a social, a sustainable and an *evolutionary* dimension in it. Those dimensions will be discussed one after another in this thesis.
As a start, however, the term *virtual* will be introduced in the next chapters.

# C. INTRODUCING *VIRTUAL*

## 1. Definition of *virtual*

“Virtual is a potent buzzword, freely applied to many situations, with many meanings” (Watson-Manheim et al. 2002, p. 2). The word derives from the Anglo-American language area and was later taken over into the German and French language area. In this process the meaning of the word changed. In the English meaning a virtual object is an object which has the most important characteristics of the object in reality. In the German and French meaning, however, there is no necessity for a link between the virtual object and the reality. Thus the virtual object could be formed without any characteristics of the reality (cf. Wolter/Wolff/Freund, 1998).

Regarding the English definition, something is seen as *virtual* when it has a specific connection to a real object. Here a virtual object cannot exist for itself but needs an object in reality like an organization, a product or a journey. This implies that virtuality always deals with the absence of physical characteristics. In general characteristics can be found when looking at the physical object as well as at the virtualized object. Whilst on the one hand, some characteristics of the physical object are lost, on the other hand, some additional possible characteristics occur for the virtual object. In a virtual journey, for example, there is no physical change of the position but other attributes such as obtaining of information about other cultures is preserved. This implies generally that a *technical dimension* is necessary (cf. ibid.).

Virtual reality is closely related to the word *virtual* and is one of the headwords of the discussions about the information age. On the one hand, virtual reality is the basis for players around the world who participate in online games, but on the other hand it is also the basis for telework. A virtual reality is created in a broadband web (i.e. Internet) where information and communication occur digitally. Virtual reality can be seen as the existence of information and communication in a digital form, available for all participants

of the respective communication or information web (cf. Fuderholz, 1998).

Last but not least, “the term has been used to identify a variety of emergent work forms that differ from traditional work on numerous dimensions, such as the location of the workers, where and how work is accomplished, and the basis for relationships between workers and organizations and between organizations.” (Watson-Manheim et al. 2002, p. 2)

# 2. Big enterprises versus small and medium sized enterprises

## 2.1. Centralization vs dezentralization

The competition in the market is characterized by globalisation to a great extent. The response of big enterprises to this fact was mainly a policy of mergers and the buying out and acquiring of other enterprises (cf. Wolter et al., 1998).

The resulting bigger size of the enterprises now has advantages if one looks at the resulting lower procurement and production costs because of the greater amounts - one can talk about the *economies of scale*. Size also matters regarding the market presence: which small enterprise can afford to make a continuous marketing campaign for their products (cf. Kemmner/Gillessen, 1998)?

However due to enormous hierarchical structures big enterprises may have to face increasing problems regarding the rising speed of the economy. It gets harder even for them to survive in an environment where fast reactions, lean and team orientated structures are demanded and where an old hierarchical structure is not able to adapt to the growing need for fast changes (cf. Tapscott, 1997).

On the other hand there are the small and medium sized enterprises that have disadvantages regarding the *economies of scale* but which have certain advantages that derive from their size: They are generally faster in reaction, more flexible, more motivated, more creative and the planning-, coordinating- and administration costs are lower than in big enterprises with their big hierarchical structures (cf. Kemmner et al., 1998).

As a result, a desirable structure for an enterprise could be a structure that is able to combine the advantages of the big enterprise (economies of scale) with those of the small and medium sized enterprise (faster, flexibility, etc.). One possible structure that is regarded to be able to provide such a desirable structure is called a virtual structure.

## 2.2. Decentralization and virtualization

### 2.2.1. General

With the advent of modern information and communication technologies new ways for big enterprises arose. They found a way of combining the advantages of centralization with those of decentralization by looking at the new possibilities of outsourcing: the idea is to create small enterprises out of the big enterprise but connect them again with the help of the new information and communication technology. Now the newly founded small enterprises have their own scope of duties and work mostly autonomously and thus faster, more flexible, are more motivated and more creative but also profit from the *economies of scale* of the partner network that used to be the big enterprise (cf. Fuderholz, 1998).

## 2.2.2. The Five-Steps-Development-Model

### 2.2.2.1. General

The process of outsourcing competences in a big enterprise and the following reintegration of them by means of the information and communication technology is in the literature called a process towards virtualization. A model representing this process is the so called Five-Steps-Development-Model. In the first step it starts with a big enterprise which then goes through five defined steps of virtualization.

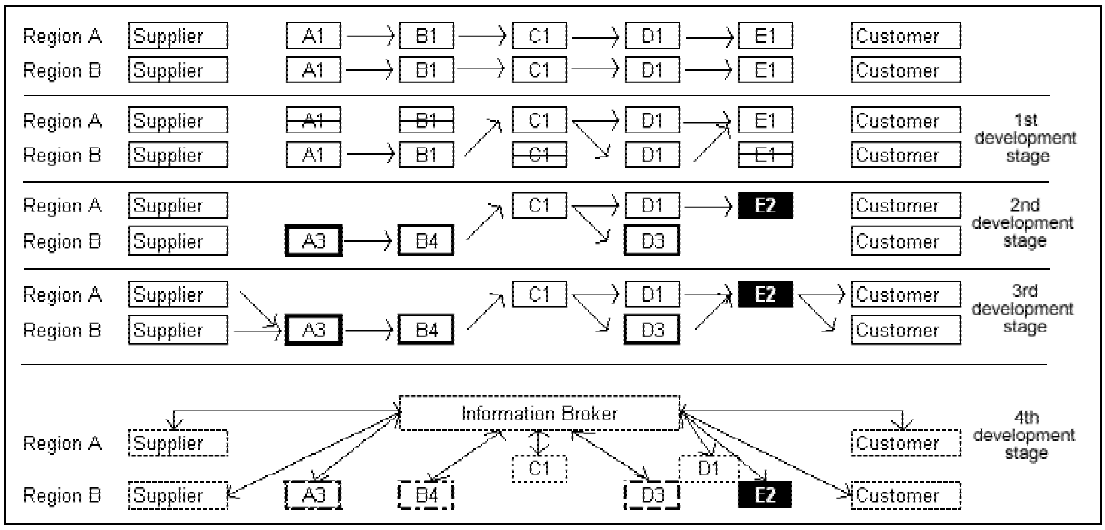


**Figure 1: Virtualization way of big enterprises**

### 2.2.2.2. 1st development stage

In the first stage of development the enterprise concentrates on its competences and tries to reduce size. Therefore, for example, it joins the production sites at one single location which then produces for all other locations.

The modern information and communication technology supports this process by lowering the transaction costs that arise due to the greater distance between the different locations (cf. Davidow/Malone, 1997).

#### 2.2.2.3. 2nd development stage

In the second stage of development the big enterprise tries to reduce size by outsourcing parts of the enterprise or by the formation of profit centers. As a result out of the big enterprise a partner network is created.
This stage is supported by inter-organizational information systems to guarantee the same efficiency as in the stage before. In general this stage involves the installation of EDI (Electronic Data Interchange) (cf. Mertens/Griese/Ehrenberg, 1998).

#### 2.2.2.4. 3rd development stage

The third stage of development is characterized through the electronic integration of the customers, suppliers and also institutions or individuals can be considered.
In this context the information and communication technology supports the information and communication between the enterprise and its stakeholders. As a result processes may be discussed by the enterprise and its stakeholders more closely (cf. Davidow et al., 1997).

#### 2.2.2.5. 4th development stage

In the last stage of the virtualisation process the enterprise has outsourced nearly all of the activities that are not part of the core competences. Therefore it can be called a *hollow corporation.* The enterprise now concentrates on the coordination of the other enterprises. It therefore becomes the so called *information broker* in the partner network (cf. Mertens et al., 1998).
If one looks at the former big enterprise it has now got small enterprises in a network with specific core competences. Those new founded enterprises can now be dynamically put together for the different needs. It can be said that the big enterprises broke the competences up into different parts and now can be combined again dynamically and flexibly (cf. Fuderholz, 1998).

#### 2.2.2.6. Result

In some industries where flexibility, speed, creativity and motivation are especially important, it can be seen that virtual structures with autonomous partners have more competitive advantages than hierarchical structures which include all competences in one single big enterprise.
A lot of global players have realized this fact and thus have decentralized and virtualized their hierarchical structures. For example, in 1997, 15% of the American employees worked in the 500 biggest American enterprises but in 1998 only 10% worked in them (cf. Kemmner et al., 1998). This strategy of outsourcing enterprise parts will continue to change the economic structures because the trend shows that most of the big enterprises stick to this virtualization process (cf. Fuderholz, 1998).

## 2.3. Centralization and virtualization

In the chapter above the possibility for big enterprises to take advantages of virtualization was introduced and how they finally combine the advantages of big enterprises with those of small enterprises to some extent. But what is about small and medium sized enterprises that will be focused in this thesis? Is moving towards an increasing size and then starting the same virtualization process the only possibility for them?
Fortunately there is another way: A strategical option for small and medium sized enterprises is the creation of virtual structures like the big enterprises try to form - but the other way round. Instead of gaining size they could create virtual structures directly. This would make it possible for them to include competences through partner networks with autonomous partners without gaining size (cf. Tapscott, 1997) and they would be still able to fulfill the demands of globalization in respect of flexibility (cf. Mayer/Kram/Patkós, 1998). If one small or medium sized enterprise now leads a certain project in the enterprise network it can, as a result, also be seen as the *information broker* (like the one in Figure 1).

## 2.4. Result

To sum up, the overall idea of the decentralization and virtualization process of big enterprise is called *quasi-externalization* and the counter part for small and medium sized enterprises is named *quasi-internalization* (cf. Faisst: Die Rolle des Brokers in Virtuellen Unternehmen. Bern. 1997. Quoted in Nissler, 2001, p. 8).

At this point it can be assumed that the realization of virtual enterprises is easier to realize for a former big enterprise (*quasi-externalization*) than for several small and medium sized enterprises (*quasi-internalization)*. The reason is that it is likely that there exist already a technical basis from the former big enterprise that started the virtualization process which now can be used for the virtual enterprises. Additional costs for necessary technical needs can also be carried by the former big enterprise.
Furthermore, it is important in virtual enterprises that there are shared basic business values. Here it can be assumed that the former big enterprise simply passes its business values to the newly created small enterprises.

Those two things can be, however, a threat for small and medium sized enterprises which want to create virtual enterprises. The technical dimension and its additional costs could be a critical decision factor in deciding whether to try to form a virtual enterprise or not. Additionally, the needed business values are harder to be set because values must be found that all partners share (see D.4. Social dimension).

# 3. Virtual organization versus virtual enterprise

## 3.1. Two main viewpoints

Looking at the previously introduced virtualization process, the results of it are finally called virtual enterprise or virtual organization. There are two main viewpoints which are concerned with these phrases:

- Computer experts especially look at the ***technical dimension***, for example, at the teleworking aspects, the possibility of virtual offices or online project work. All in all they look at the possibilities of the information and communication technology when they think of the virtual organization/enterprise.

- On the other hand business people focus on the ***economic dimension*** of the virtualization. This dimension has to do with the possibility to serve the market with a new inter-organizational organization model. This model was introduced in the Five-Steps-Development-Model. In this context now the phrases virtual organization/enterprise are also used.

There arise great chances for organizations which look at both, the technical viewpoint as well as the economic viewpoint of the virtual organization/enterprise. Thus, the two dimensions are included but dealt with mainly seperately in this work.

## 3.2. Three main interpretations

On the basis of the two viewpoints presented in the chapter above three main interpretations evolved regarding the virtual organization/enterprise:

1. Sometimes enterprises call themselves a virtual organization/ enterprise but only think of their use of information and communication technology. They, for example, use it for their internal organization of processes, the opening up of virtual markets or for virtual production planning.
   This interpretation, however, doesn't fit into the virtualization idea. In this context the phrase *digitalized enterprise* matches the idea better (cf. Wolter et al., 1998).

2. Virtual organizations/enterprises are regarded to be the result of various changes in and between the structures of organizations. This interpretation has been introduced in the Five-Steps-Development-Model (see 2.2.2. The Five-Steps-Development-Model). It has been shown that through the modern information and communication technology, organizational boundaries may disappear and enterprise networks may arise. In this context, the phrase virtual organization and virtual enterprise is regarded as the resulting inter-organizational structure (cf. Winand/Nathusius, 1998, Alpar/Grob/Weimann/Winter, 1998).

3. Finally, however, the virtual organization/enterprise is also seen as a project organization that is likely to be created out of a virtual organization structure. This interpretation has developed into the atypical definition of the virtual organization/enterprise (cf. Wolter et al., 1998, Mertens et al., 1998, Fuderholz, 1998).

## 3.3. Possible virtualization way

Considering the three main interpretations mentioned above, the following could be a possible virtualization path for a small enterprise towards the atypical virtual organization/enterprise. There are no exact boundaries around the different steps so this figure should be seen as a model to demonstrate the main differences.

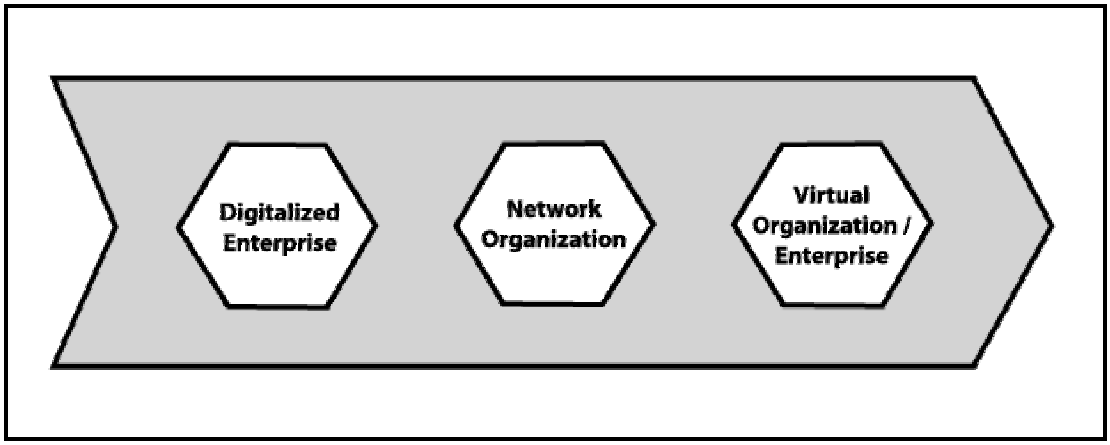


**Figure 2: Possible Virtualization Way (cf. Wolter et al., 1998)**

If an enterprise realises the first steps it becomes predestinated for the final atypical virtual organization/enterprise. As a rule, one step follows the other but this is not a must (cf. ibid.).

## 3.4. Virtual organization versus virtual enterprise

The phrases virtual organization and virtual enterprise can be used in the same sense. However, what can be seen is that in the literature the phrase virtual enterprise is more likely to be used to describe the atypical project organization idea and the phrase virtual organization is more likely to be used to describe the wider idea of virtualization in general.

For a better understanding of this thesis at this point a differentiation between the phrases virtual enterprise and virtual organization is relevant.

A) The phrase **virtual enterprise** describes the atypical project organization idea that will be focused in this thesis.

B) The phrase **virtual organization** describes the wider idea of virtualization that is related to the Five-Steps-Development-Model (see 2.2.2. The Five-Steps-Development-Model). Looking at this broader idea the parts that are not related to the atypical project organization idea from above are excluded in this thesis.

To sum up in this thesis the focus is laid on virtual enterprises and the virtual organization will only be analyzed looking at its partner network in relation to the virtual enterprises. The following figure should illustrate the focus of this thesis regarding the virtual organization/enterprise:

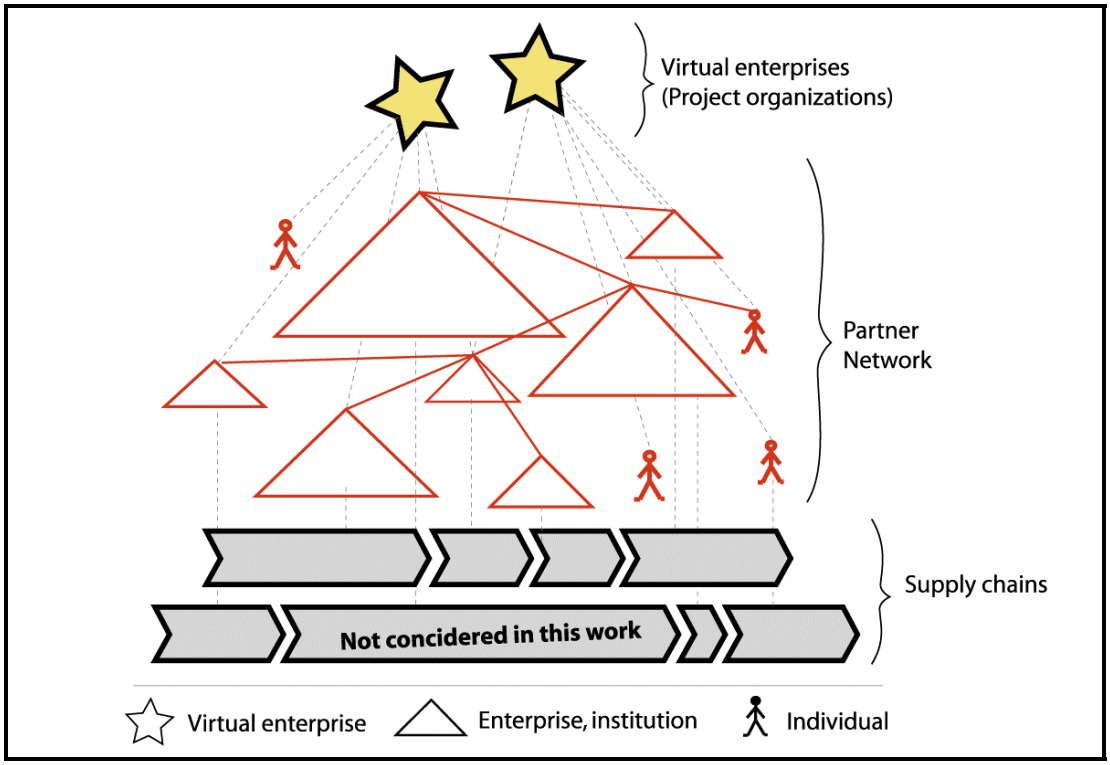


**Figure 3: Focus of this diploma thesis regarding the virtual organization/enterprise**

# D. VIRTUAL ENTERPRISES

## 1. General

### 1.1. Definition of the virtual enterprise

The following definition of the virtual enterprise is based on the atypical project orientated viewpoint (see 3.2. The main interpretations).

*The virtual enterprise exists for a project with and is formed by autonomous enterprises and/or institutions and/or individuals. The work is done in a best of everything enterprise because the partners bring in especially their core competences. They together form a virtual enterprise where they work together hierarchically or vertically on the basis of shared values. The partners work in a decentralized way and lower the transaction costs by the use of information and communication technology. The virtual enterprise exists until the mission of it is finished* (cf. Kemmner et al., 2000, p.11).

### 1.2. Characteristics of the virtual enterprise

The following list summons the characteristics of the virtual enterprise. Those characteristics will be a point of reference for this thesis and will be discussed in detail. The characteristics of the virtual enterprise:

1. **The virtual enterprise is a project organization of partners with one mission**
   See 1.3. The life of the virtual enterprise
2. **The partners bring in their core competences**
   See 1.3.3.Partner search
3. **The partners are legally independent**
   See 2.3.5.Virtual organizations

4. **The virtual enterprise is created out of or creates a partner network**
   See 2.4.The partner network
5. **An information broker coordinates the project**
   See 1.5.The information broker
6. **The stakeholders are included**
   See 2.7.Overall result
7. **The partners use information and communication technology for their work**
   See 3.Technical dimension
8. **The partners act autonomously**
   See 4.Social dimension
9. **The cooperation is based on trust**
   See 4.3.The importance of trust
10. **Self-organization is being supported**
    See 4.5.System self-organization

This list does not match all definitions of the atypical virtual enterprise because the definitions vary from one another. (Cf. Wolter et al., 1998, Mertens/Griese/Ehrenberg, 1998, Fuderholz, 1998).

## 1.3. The life of the virtual enterprise

### 1.3.1. General

Refering to the characteristics of the virtual enterprise the virtual enterprise is first of all a project based form of organization (cf. Fuderholz, 1998, Wolter et al., 1998) (see 1.2. Characteristics of the virtual enterprise). Different concepts on how the project and thus the life of the virtual enterprise looks can be found in the literature. However, what they have in common is that there is an initiation phase at the beginning, an operative phase in the middle and one final phase at the end. Some additional steps are sometimes assigned to those main phases.

For this thesis, a concept which focuses on five phases should be used. The following figure illustrates those phases which will afterwards be introduced.

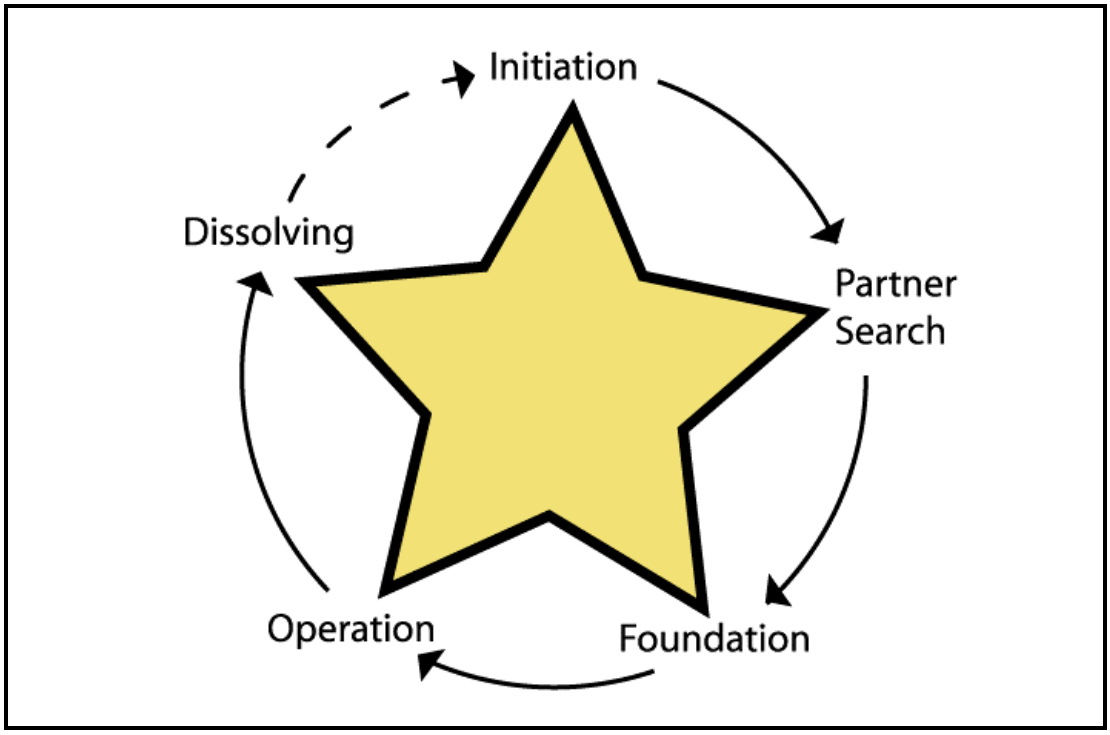


**Figure 4: Life of a virtual enterprise (cf. Mertens et al., 1998)**

## 1.3.2. Initiation

### 1.3.2.1. Having an idea or an order

The reasons for the initiation of a virtual enterprise are ideas and innovations or an order of a customer (cf. Tapscott, 1997) (see 1.2. Characteristics of the virtual enterprise). The realization of them now becomes the project mission of the virtual enterprises.

### 1.3.2.2. Internal analysis

The partner who has the idea and initiates the virtual enterprise will generally start with an internal analysis. The purpose of this internal analysis is that he checks his core competences and on that basis the missing competences for the virtual enterprise can be seen more easily (cf. Mertens et al., 1998).

### 1.3.3. Partner search

The missing competences which are found in the internal analysis are then used to search for legally independent partners who should bring along the missing competences (cf. Mertens et al., 1998). Those partners now can be enterprises and/or institutions and/or individuals (cf. Fuderholz, 1998, Wolter et al., 1998).

At the end of this phase partners should be found that are willing to become a part of the virtual enterprise. They should bring in especially their core competences and professional skills to solve realize an appropriate part of the mission (cf. Mayer et al., 1998).

### 1.3.4. Foundation

In the foundation phase the common strategy for the virtual enterprise is created and the aims, capacities and resources are arranged between the partners (cf. Mertens et al., 1998).

### 1.3.5. Operation

In the operating phase each partner mainly works on his tasks in relation to the overall project mission autonomously (cf. ibid.).

### 1.3.6. Dissolving

The virtual enterprise ends when the mission is completed or when it is cancelled because of problems. When it is finished positively, further responsibilities that may appear have to be arranged (cf. ibid.).

## 1.4. Types of virtual enterprises

Virtual enterprises can be created out of a stable partner network including only partners from within the network, but can also be created with partners from within and outside the network or they can also be created by newly met partners without any network:

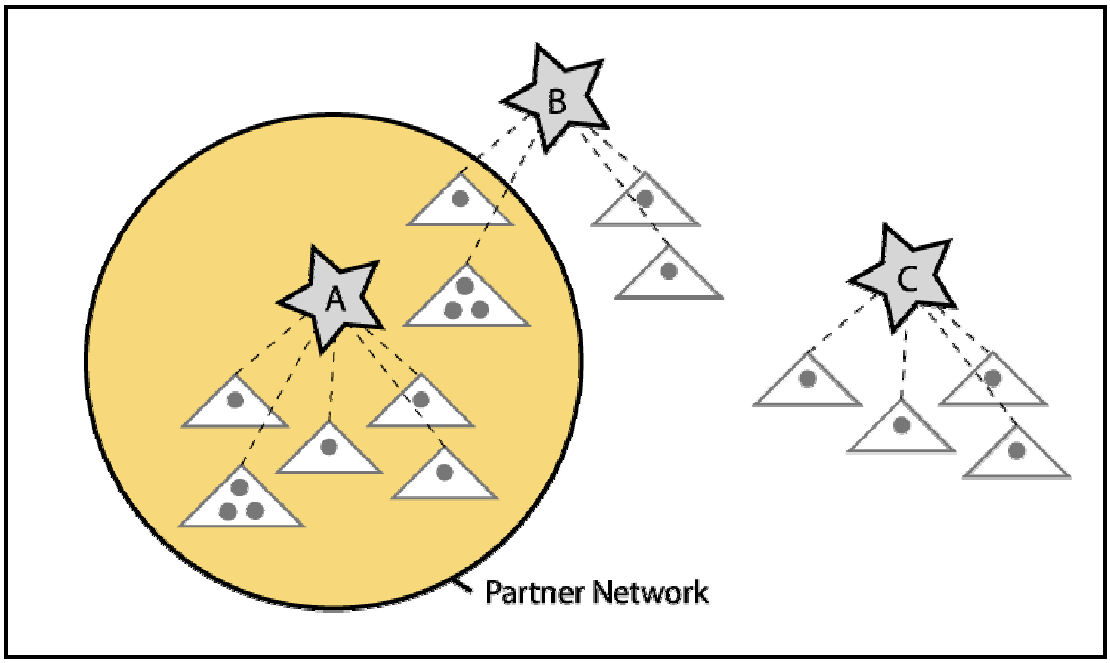


**Figure 5: Typisation of a Partner Network (cf. Mertens et al., 1998)**

The single virtual enterprise is created out of or creates a partner network. The reason for this is that if there is no network at the start, at least a kind of social network is created afterwards. When a new virtual enterprise is initiated the partners in the social network return to their former relationships again (cf. Winand et al., 1998).

## 1.5. The information broker

The virtual enterprise is a lean organization in which the partners work autonomously. However, due to the decentralisation a coordinating manager is still needed. In this context the term of the *broker*, *information broker* is used, whose task is to fulfill the related necessary tasks. If an enterprise takes the role of the broker, it is called the *leader* (cf. Mertens et al., 1998). In this thesis the coordinating manager who can be one partner or can be several partners, will be called the information broker

The main tasks of the information broker are to initiate the virtual enterprise, to provide the needed information and communication infrastructure and, furthermore, he has to guarantee the information flow between the partners. In this context conflict management also becomes a task of the information broker (cf. Mertens et al., 1998). More information about the information broker will be given in the chapter 4.2.4.The role of the information broker.

# 2. Economic dimension

## 2.1. General

The next chapters will look at the economic basis of the virtual enterprise in more detail. As a start it will give insights to the economic basis of virtual enterprises, namely to cooperation and networks.

## 2.2. Cooperations

Networks, partnerships, clusters, alliances and virtual enterprises are possible forms of cooperation and are becoming increasingly common words in the economy. Looking at cooperation it can be seen that in them the competition between the partners is not replaced but has a different character: Because the competition in the cooperation is only function

orientated one can talk about a *collective competition* or a so called *coopetition* (which merges the words *coop*eration with compe*tition*) (cf. Gomes-Casseres. 1996. Quoted in Winand/Nathusius, 1998, p. 12.).

All in all, enterprise cooperation tries to combine their strengths and realise a kind of *collaborative advantage* which can be achieved through the following positive effects:

1. Less costs in production or coordination
2. Use of external resouces
3. Possibility of (faster) market entry
4. Reduction of economic risks

(cf. Winand et al., 1998, Sell, 1994, Mayer et al., 1998)

## 2.3. Networks

### 2.3.1. General

One can distinguish between different types of networks. In general, networks are created for a long-term purpose like in the automobile industry, or they are created for a project purpose like in the movie industry. Additionally, it seems to be important for a typology that networks can either be managed hierarchically in a pyramid structure or heterarchically (where the partners have the same rights and responsibilities).

The following matrix summons the different possible types of enterprise networks:

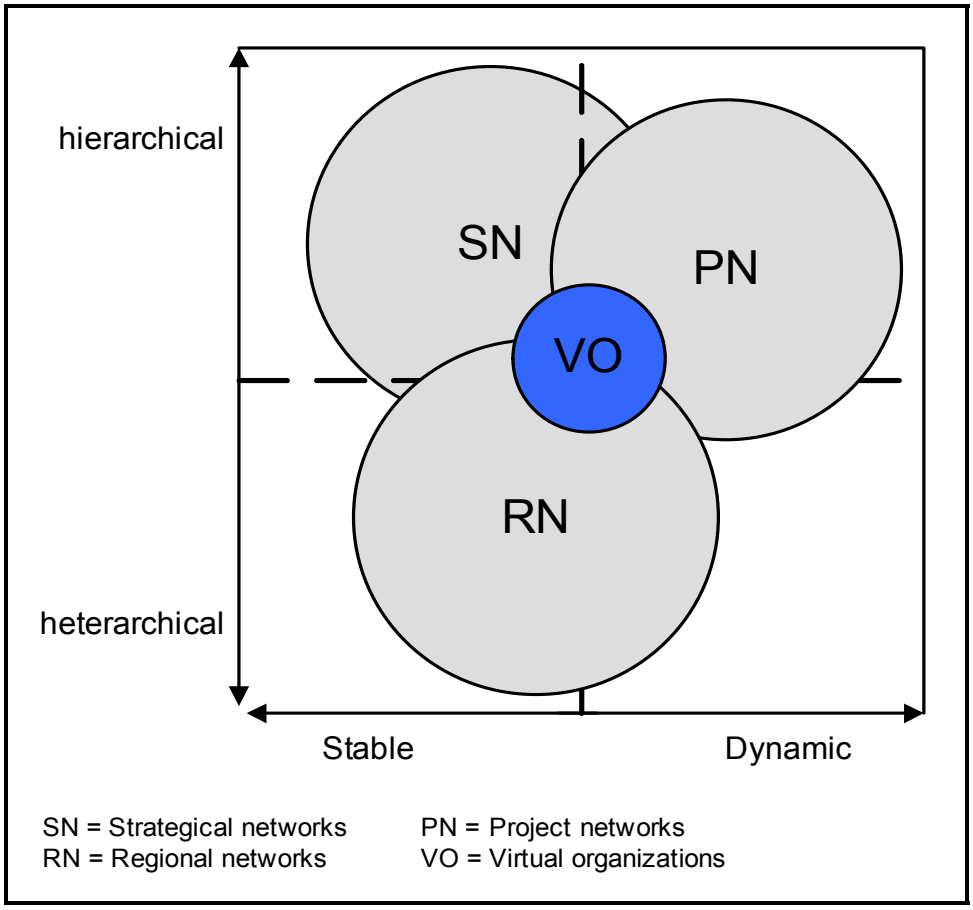


**Figure 6: Enterprise Network Types (cf. Winand et al., 1998)**

### 2.3.2. Strategical networks

Strategical networks are lead by one or more focal enterprises hierarchical. The focal enterprise has more power than the others; for example which market should be focused, which strategies should be followed and which technologies for the organization of the network should be implemented.

These kinds of networks can, for example, be found in the automotive industry. Examples of such enterprises are Nike, Puma or Dell which use the network around them to a great extent. Therefore they are called *manufacturers without factories* (cf. Winand et al., 1998).

### 2.3.3. Regional networks

Regional networks consist of small and medium sized enterprises and are characterized by their regional extension and their used emergent strategies which derive from the heterarchical organization form and the missing of a strategical leader. Examples of regional networks can be found in Silicon Valley (cf. Winand et al., 1998).

### 2.3.4. Project networks

Project networks differ from the other forms mainly because of their temporary character. Thus the fluctuation of the partners is likely to be very high. Project networks are usually lead by a focal enterprise but also heterarchical networks can be created (cf. Winand et al., 1998).

### 2.3.5. Virtual organizations

#### 2.3.5.1. Hierarchical versus heterarchical

What stands out is that virtual organizations can be hierarchically or heterarchically lead. At this point one has to distinguish if the whole virtual organization and/or the virtual enterprises and/or the tasks of it are hierarchically or heterarchically lead. This will be discussed in the following:

1. **Virtual organization**: This thesis looks at the virtual organization only considering its partner network for creating virtual enterprises (see C.3.4. Virtual organization versus virtual enterprise). Looking at the partner network it can be lead by a focal enterprise hierarchically or it can be lead heterarchically by all the partners in it.
   An example of a hierarchical lead partner network is the one that results out of the Five-Steps-Development-Model (see C.2.2.2. The-Five-Steps-Development-Model)
   Looking at small and medium sized enterprises the partner network is thought to be lead heterarchically because this includes the collective advantage that every partner can initialize virtual enterprises.

2. **Virtual enterprises**: The current work, however, is done in virtual enterprises. Therefore it becomes legally important if the single virtual enterprise is lead hierarchically or heterarchically. The differences are:

    a. One partner hierarchically leads the virtual enterprise and thus takes over all the rights and responsibilities of it.

    b. All partners lead the virtual enterprise heterarchically. In this case all partners take over the rights and responsibilities of it.

    If there are no contracts in the single virtual enterprise it is legally seen as a form of company where the partners are the stakeholders. (Mayer/Kram/Patkós, 1998, p. 55-57, 71).

3. **The tasks**: What differs the virtual enterprise from project networks is that in virtual enterprises the partners work decentralized and enabled by the information and communication technology (cf. Winand et al., 1998). This, however, leads to the circumstance that the tasks of the partners cannot be lead and controlled hierarchically in the traditional way. Each partner becomes autonomous and the tasks are therefore lead heterarchically. This important fact will be discussed in the social dimension of this thesis in more detail (see 4. Social dimension).

#### 2.3.5.2. Stable versus dynamic

In the matrix above (figure 6) it is shown that virtual organizations are situated between dynamic and stable forms of networks. The reason for this is that the broader concept of the virtual organization with its stable partner network is combined with dynamically created virtual enterprises which are created out of it (see C.3.4. Virtual organization versus virtual enterprise).
The following chapter will give some information about the idea of the partner network in relation to virtual enterprises.

## 2.4. The partner network

### 2.4.1. Advantages of the partner network

In the partner network there can be enterprises, institutions and/or individuals (cf. Kemmner et al., 2000) that stay together for creating virtual enterprises. It can provide advantages for the partners in it because in practice it has been shown that the *ad-hoc* creation of virtual enterprises is more lucrative when there is already a partner network:

1. One thing that makes it more lucrative is that an organizational and technical infrastructure is usually already there to start with. The given infrastructure now makes it easier and faster for partners inside the network to create virtual enterprises *ad-hoc* without implementing a technical infrastructure before.

2. The second thing that makes the partner network interesting is that it minimizes the starting problems regarding the mutual trust that the partners must have. The reason is that trust cannot be created *ad-hoc* and therefore the partner network is predestined because the partners in it know each other already and thus may start from a common basis of trust (see 4.3. The importance of trust)

3. Finally, the partner network is lucrative when one looks at the chance to be able to store the created *know-how* of the finished virtual enterprises. Therefore it can be used again for the next virtual enterprises and additionally an organizational learning is possible (cf. Mertens et al., 1998).

When it happens that there are not enough competences in the partner network for a new specific virtual enterprise, then new partners can be included for the time the new virtual enterprise lasts. If the new cooperation partners were finally trustworthy and the mission was positive, the including

of the new partners in the partner network is obvious (cf. Mertens et al., 1998).

### 2.4.2. Main questions regarding the partner network

The main questions which arise when partners want to create a partner network for virtual enterprises are as follows:

- Which information and communication systems should be implemented?
- What are the rules of accepting a new partner for the partner network or releasing another?
- On which levels should the cooperation take place?
- How can the existing processes of the single partners be modified to be able to cooperate more easily?
- Is it possible to work without contracts?
- Who acquires the orders?
- Which organization or person leads the partner network?
- How is the know-how stored that is produced in the virtual enterprises?
- What common initiatives can be made to support the network (i.e. lobbying or common advertising campaigns)

(cf. Kemmner et al., 2000)

## 2.5. The tasks and missions of the partner network

Virtual enterprises are based on the information and communication technology and therefore physical work cannot be done in them. Therefore the mixing of a new receipe for a drink cannot be done in a virtual enterprise but the research and development that is based on the information- and the communication that is needed can be done (Fuderholz 1998, p. 17) (This example is related to the pilot scheme MAKAvAVirtual, see G. PILOT SCHEME MAKAvAVirtual).

Furthermore, it can be assumed that the coordination of any mission however can be supported by a virtual enterprise. Looking at the example above, the whole product development process of a new drink could be coordinated in a virtual enterprise and the partners could do the physical work outside the virtual enterprise but put their results into the common technical platform of the virtual enterprise. This platform then summons the different working results and coordinates the overall process of the mission.

## 2.6. Creativity and innovations

### 2.6.1. Creativity

There are possibilities how creativity can be supported in an organization. The following table introduces the fundamental components that support creativity.

| **Components of creativity** / **Elements of the organization** | Know-how | *Thinking rules* | Psychological drives |
|---|---|---|---|
| Organization structure | 1 | | |
| Operational structure | 2 | | 11 |
| Standardisation | 3 | | |
| Division of labour | 4 | | 12 |
| Leadership behaviour | 5 | 8 | 13 |
| Human resources development | 6 | 9 | 14 |
| Information and communication behaviour | 7 | 10 | 15 |

1 Matrix organization
2 Project management

| | |
|---|---|
| 3 | Reduction of bureaucratically processes |
| 4 | Job rotation |
| 5 | Sharing information with the employees (creating an integrated view related to the organization) |
| 6 | Possibility of further training |
| 7 | Free access to relevant information; open communication |
| 8 | Supporting unconventionally thinking; openness in relation to changes |
| 9 | Creativity training |
| 10 | Cooperative working; moderation training |
| 11 | Autonomy in the solving of specific tasks |
| 12 | Delegation of responsibilities |
| 13 | Employee orientated management |
| 14 | Promotion rules that also concern social competences |
| 15 | Free interchange of ideas regarding the organization |

The virtual organization has the following elements that support creativity can be found:

1. Matrix organization: The partners work autonomously. For that reason every partner is related to the other partners and a matrix organization is built.
2. Project management: The virtual enterprise is a project organization.
3. Reduction of bureaucratically processes: Self organization is focused by the virtual enterprise and therefore there is a reduction of brueacratically processes.
5. Sharing information with the employees: The information broker in the virtual organization needs to share the information with his employees to support autonomous working.
7. Free access to relevant information; open communication: The partners get access to the information and an open communication is supported by the technical dimension.

10. Cooperative working; moderation training: The partners cooperate in the virtual enterprises.
11. Autonomy in the solving of specific tasks: The partners work autonomously. The information broker delegates responsibilities to the partners so that they can make relevant decisions alone.
13. Employee orientated management: Due to the autonomy of the partners the information broker has to focus the partners and not their work (see 4. Social dimension).
15. Free interchange of ideas regarding the organization: The partners interchange ideas supported by the information and communication technology.

As a result one can see that the virtual enterprise supports creativity due to its organizational elements.

### 2.6.2. Innovation

Supported by the information and communication technology innovations and inventions may be created with the know-how and ideas of various people. Those innovations and inventions then may serve the wishes of various stakeholders. Additionally the innovation process is being supported by the creativity factors introduced in the above chapter.

Each country needs organizations that are creative and innovative because development is based on innovations. It can be seen that those innovations are more likely to be created by small and medium sized enterprises instead of big enterprises.
The problem, however, is that managers can't demand innovations from their employees. They need motivation and a trusting relationship in their teams. Thus one of the main needs of an economic - technical network where partners have a loose connection is to create a surrounding in which innovation can take place and is rewarded and supported (cf. Tapscott, 1997) (more about the the social dimension can be found in 4. Social dimension).

## 2.7. Overall result

The virtual enterprise is exclusively created with partners that bring in their core competences (cf. Fuderholz, 1998, Wolter et al., 1998). This refers to the fact that the virtual enterprise is a lean form of organization because only the needed competences are included (cf. Winand et al., 1998). Customers, suppliers and other stakeholders that have to do with the project become cooperation partners too (cf. Tapscott, 1997). This makes the virtual enterprise economically interesting because the model lean organization can be regarded as a *best-of-everything* organization (cf. Mayer et al., 1998) that supports creativity and innovations.

To sum up, the following figure illustrates the role of the economic dimension in relation to virtual enterprises:

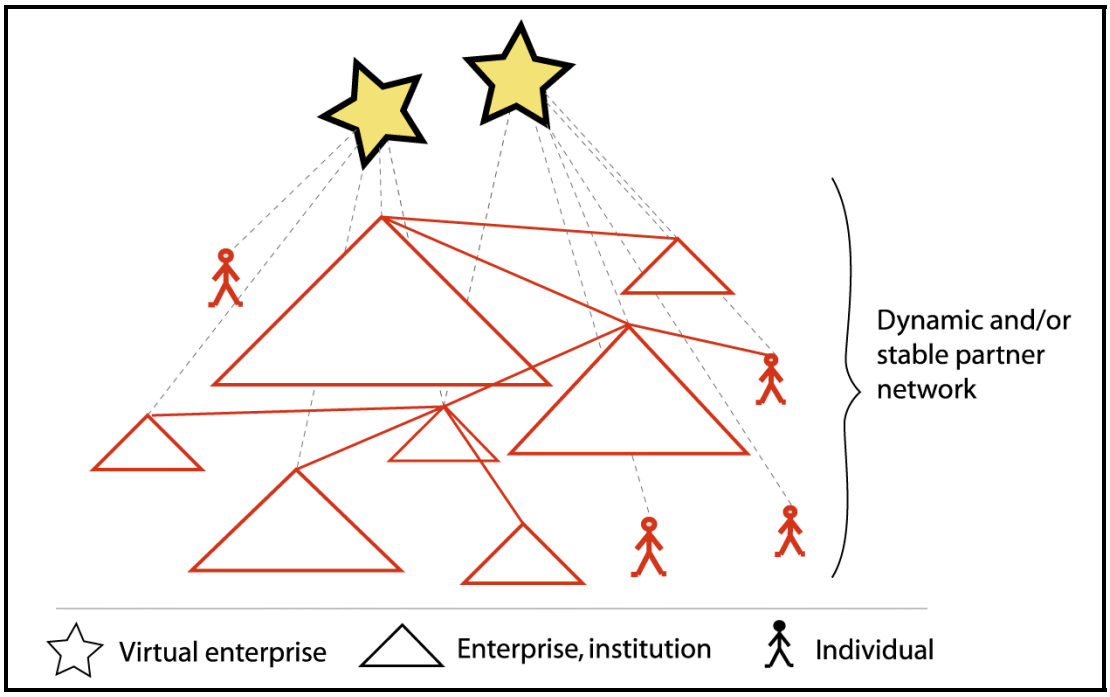


**Figure 7: Economic dimension in relation to virtual enterprises**

Finally, it can be said that the economic part of this diploma thesis is theoretically true: ***Virtual enterprises can support small and medium sized enterprises to dynamically include decentralized competences for innovative project missions.***

# 3. Technical dimension

## 3.1. General

Via an information and communication basis the various partners of the virtual enterprise are abled to work together even if they are perhaps situated all over the world. The technical dimension now becomes the enabler for this organization form because it collects the decentralized know-how and the information and unites it (cf. Mayer et al., 1998, Winand et al., 1998).
Most of the supporters of the virtual enterprises even think that the new information and communication technology is the driving force for the creation of them (cf. Tapscott, 1997).

## 3.2. Technical network basis

### 3.2.1. General

Regarding the technical dimension of virtual enterprises it can be said that the interlinking of computers has to be the basis (cf. Winand et al., 1998). Due to this fact virtual enterprises need a technical network which makes the connection of computers possible.
The following chapters should prove which network basis fits best regarding small and medium sized enterprises. The advantages and disadvantages of the two main technical network possibilities will be explained.

### 3.2.2. Private wide area networks

*Private Wide Area Networks* are formed when existing local area networks (LANs) are connected through bridges, for example, over ISDN. This can be done with a dedicated rental line as well as with a telephone circuit.
The main advantages of this way of connection are that it is regarded to be fast, secure and reliable. The main disadvantages are that the costs for it are relatively high and that the used network protocols etc. have to be defined for which a lot of know-how is needed. Furthermore, this infrastructure is relatively unflexible (cf. Wolter et al., 1998).

### 3.2.3. The Internet

The Internet is the biggest and fastest expanding network and it consists of various different networks. It uses standard protocols and therefore it makes a world wide communication between computers possible (cf. Wolter et al., 1998).

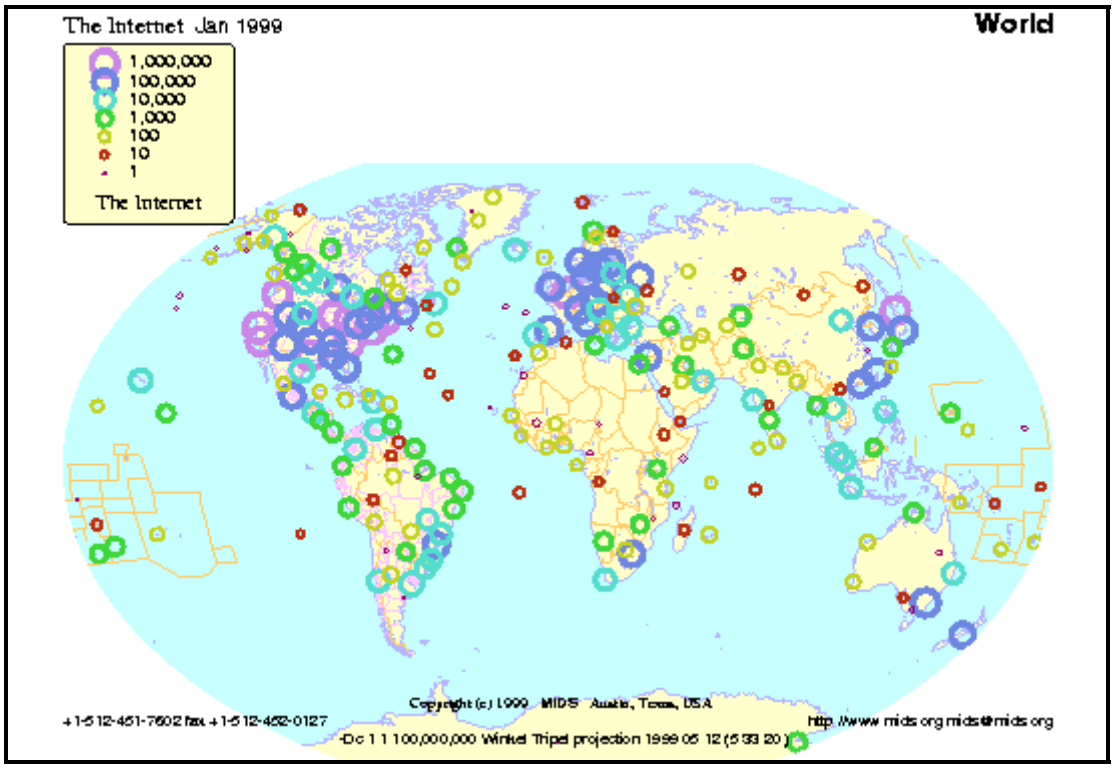


**Figure 8: Hosts on the Internet, January 1999 (cf. Mids, 1999)**

The above figure shows the computers around the globe that were connected to the Internet in 1999 (cf. ibid.). Internet traffic continues to double about every 12 to 18 months. Currently, there are approximately 900 million Internet users world-wide (cf. Burns/McCallum, 2005).

Advantages of the Internet for virtual enterprises are that there are open standards which can be used, that the costs for using it are relatively low and, as said above, millions of people around the globe can be reached in this *network of networks* (cf. Wolter et al., 1998).
The arguments regarding disadvantages of the Internet are that it can be

unreliable and insecure. In practice this disadvantages, however, seem to be less serious than sometimes predicted. New security standards, coding mechanisms or firewalls can be used to improve the security level (cf. Wolter et al., 1998).

## 3.3. Technical software basis

### 3.3.1. General

Mainly two types of software can be used to realize virtual enterprises: proprietary software or open source software. In the following those two types will be briefly introduced.

### 3.3.2. Proprietary software

Proprietary software is owned by a particular company and typically the right to use it is granted when the software is bought. Users have no access to the source code of proprietary software and thus cannot modify it (cf. Sauerburger, 2004).
On the other hand, an advantage is that there are guarantees and hotlines where problems can be discussed directly with the producer.

### 3.3.3. Open source software

The main idea beyond open source software is that everyone has the permission to run the software, copy it, modify it and distribute modified versions as long as they do not add any restrictions of their own. The source code is freely available and therefore there are no acquisition costs for open source software. Open source software is developed by various participants from a wide range of technical backgrounds.

The figure below shows an example where one can see that open source software can be powerful. It shows the software products that are used for the web servers in the Internet. It can be seen that the open source web server called Apache lies far before the other web servers (cf. E-Soft, 2005).

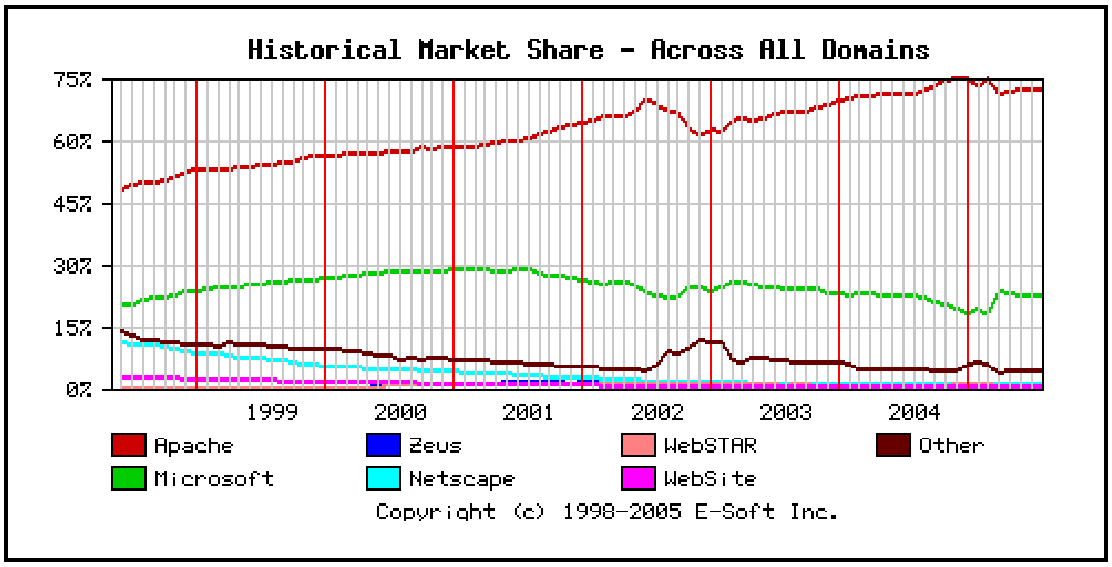


**Figure 9: Market share of web server software (cf. E-Soft, 2005)**

## 3.4. Possible needs

### 3.4.1. General

When looking at the information and communication technology many needs can be found regarding virtual enterprises. The following lists made by Nissler present needs that could be fulfilled (cf. Nissler, 2001).

### 3.4.2. Technical needs

A1. **Interoperability**: The data that is sent should be understood by all the partners. Thus standards should be used.

A2. **Secure communication**: There should be mechanisms that guarantee that the data that is sent cannot be viewed by unauthorized people.

A3. **Platform independent**: The software that is used should be compatible for the platforms that are used by the partners.

A4. **Plug-and-Play functionality**: The software should be able to be simply added by any partner.

A5. **Updates are possible**: A great functionality for virtual enterprises is if the software can be updated easily by every partners.

A6. **Multimedia is possible**: It can be of great advantage if pictures and/or videos and/or sound can be used.

A7. **Expandability**: The customization, updating or changing of the software should be possible for adding features that are needed. If proprietary software is used at least a good documentation should be available.

### 3.4.3. Administration needs

B1. **User Management**: A user management is of importance for virtual enterprises. The manager should be able to give roles to users and groups to be able to identify them in the system. As a result the content can be assigned to the different roles in various ways. This is important when various groups have access, such as, for example, suppliers, customers, producers etc.

Here one can talk about the so called *identity management*. It is the management that deals with the digital identity of the participants. It cares about the creating, providing, integrating, transforming, using and terminating of identities (cf. Sauerburger, 2004).

B2. **Authentification of users**: Through an authentification where the user has to log in with a user id and a password a misuse of the data can be prevented.

B3. **Administration of various virtual enterprises**: The software should be able to support several virtual enterprises at once. This can be useful if the same broker leads various virtual enterprises at once.

### 3.4.4. Information needs

C1. **Remote access**: An important need for an effective use of the available information is the possibility to get access to it from anywhere.

C2. **Anytime access**: The information should be accessable at any time.

C3. **Backup possibility**: A backup possibility for the data can be useful to be able to restore the system after a crash down.

C4. **Up-to-date**: The data should be up-to-date to guarantee that the users are up-to-date too. In this context the system could inform the users automatically when changes are done to the data that is relevant for him/her.

C5. **Different document types**: In the system it should be possible to administer different document types such as pictures, documents, URLs, events etc.

C6. **Alter documents**: There should be generally the ability to add, rename and delete documents.

C7. **Information structure:** To organize the various documents an information structure with, for example, user folders should be available.

C8. **Meta Data:** The adding of additional information to a certain document that describes it is called meta data. This data can include the name of the authors, date of creation, keywords for a search function etc.

C9. **Search and filter functions:** To save time search and filter functions should be available for the user.

C10. **Versioning:** It can be useful if the system creates different versions of the documents when they are altered. Thus if an older version is needed again it would be still available in the system.

### 3.4.5. Communication needs

D1. **E-Mail**: The system should provide the possibility of sending E-Mails and receiving E-Mails. In addition the sending of an E-mail to a certain group can be useful.

D2. **Bulletin-Board-Systems**: Bulletin-board-systems can be useful because users can use them to post messages that can then be viewed and commented on by others.

D3. **Conference-systems**: Audio, video or desktop conferences can be useful because they are close to face-to-face contact.

D4. **Chat**: A chatroom can be useful for the partners to communicate quickly. Buddy lists may be included where the users can see the status of the others (“is online”, “is offline” etc.).

### 3.4.6. Coordination needs

E1. **Project-management-system**: Because the virtual enterprises are project organizations a project management system could support the coordination. A feature is when users can be assigned to tasks in the project management system.

E2. **Workflows**: Workflows can help to coordinate the work in virtual enterprises.

E3. **Calendar**: A calendar can store necessary information about private or public events, deadlines, etc.

E4. **Address book**: There should be contact information about the partners that are involved in the virtual enterprises as well as necessary contacts to solve the mission.

### 3.4.7. Collaboration needs

F1. **Group decision support systems**: With group decision support systems the partners can make decisions together while being physically not at the same place.

F2. **Application sharing**: Through an application sharing mechanism the partners may work simultaneously on the same data. An example could be a multiple-user-editor.

### 3.4.8. Additional needs

G1. **Usability**: The system should be easy to use for all partners. Additionally, personalization, where one can store layout can be a part of the usability.

G2. **Costs**: For small and medium sized enterprises which are the focus of this thesis the costs for a technical system that enables virtual enterprises should be low.

## 3.5. Possible technical basis

The following possible technical basis for virtual enterprises is created on the technical network basis of the Internet in connection with the open source software Zope. “Zope is an application server for building content management systems, intranets, portals, and custom applications. The Zope community consists of hundreds of companies and thousands of developers all over the world, working on building the platform and Zope applications.” (Zope Web Site 2005, http://www.zope.org)

In the following table the possible needs of the virtual enterprises from above will be related to Zope to see if Zope can be a possible technical basis for virtual enterprises.

| Technical needs | |
|---|---|
| Interoperability | Yes, due to the standards of the Internet and the open standards of Zope. |
| Secure communication | Yes, there are algorithms implemented in Zope that make a secure connection possible. |
| Platform independent | Yes, Zope can be installed and used on most common web-servers (for example Linux, Windows). |
| Plug-and-Play functionality | Yes, if Zope is installed on a server it can be used by all partners that are connected to this server through the Internet. |
| Updates are possible | Yes, one can update Zope online and as a result all partners can use the updated version of it. |
| Multimedia is possible | Yes, all multimedia files that are generally used in the Internet can be used in Zope. |
| Expandability | Yes, the software is open source and can be changed. Additionally the Zope community is usually helpful if there arise problems. |
| **Administrational needs** | |
| User Management | Yes, Zope provides one of the most powerful user management interfaces that are available. Roles, groups and security states of the objects can be managed easily by the administrators with different rights. A powerful identity management is therefore possible in Zope. |
| Authentification of users | Yes, the user acquires his role through authentification. |
| Administration of various virtual enterprises | Yes, Zope can manage the administration of various different virtual enterprises at the same time. |

| Information needs | |
|---|---|
| Remote access | Yes, due to the fact that Zope can be reached through the Internet remote access is possible. |
| Anytime access | Yes |
| Backup possibility | Yes, in Zope one can make backups through exports of the portals or one can make a backup of the whole server. |
| Up-to-date | Yes, in Zope the software product Plone can additionally be installed. For this purpose tools are available that can for example inform the user automatically about changes by E-mail. |
| Different document types | Yes, Zope delivers a lot of different document types and one can create additional document types. |
| Alter documents | Yes, documents can be altered by users that are given the right to do so. |
| Information structure | Yes, Plone is a content management system in which folder structures can be created. |
| Meta data | Yes, Plone gives the possibility to add keywords to each object that become then, for example, searchable by the user. |
| Search and filter functions | Yes, Plone provides search and filter functions for all objects. |
| Versioning | Yes, there exist versioning tools for Zope. |
| **Communication needs** | |
| E-Mail | Yes, Zope and also Plone can handle E-Mail functionalities like sending, receiving etc. |
| Bulletin-Board-Systems | Yes, Plone objects can be commented on by the users. |
| Chat | Yes, Plone offers chat tools. Additionally buddy lists shown which user is online. |

| Coordination needs | |
|---|---|
| Project-management-system | Yes, the tool Zepp which can be added to Plone is a project management system where users can be assigned to tasks. |
| Workflows | To some extent; a workflow system is included in Zope. Additionally customized workflows can be added to objects however there are no pre-defined workflows available. |
| Calendar | Yes, several calendar tools can be used in Zope or Plone. |
| Address book | Yes, for Plone an address book tool is available. |
| **Collaboration needs** | |
| Group decision support systems | Yes, group decisions can be made with several tools in Zope. |
| Application sharing | To some extent; a multi user editor is available but specific software needs to provide the application sharing functionality itself. |
| **Application needs** | |
| Usability | Yes, when using Plone as a portal, for example, the text size and the styles can be changed. |
| Costs | There are no acquisition costs for the software because it is all based on open source software. Only the Internet costs have to be calculated. |

An interesting fact is that the open source software Zope (in combination with some other tools that relate to it) theoretically fulfills the needs that were presented in the list of Nissler above.

However for the practical implementing of the open source software specific know-how is needed because the different modules have to be installed and configured. Additionally specific needs may not be available and thus have to be programmed newly.

## 3.6. Overall result

The Internet has some advantages for small and medium sized enterprises if used as a technical network basis. It provides access for the partners from nearly everywhere at any time and standards may be used or not. Finally, the costs for it are relatively low.

The main advantages of open source software are that there are no acquisition costs. However, it was possible to prove that, for example, the open source software Zope theoretically supports the technical needs of virtual enterprises.

To sum up, the following figure illustrates the role of the technical dimension in relation to virtual enterprises:

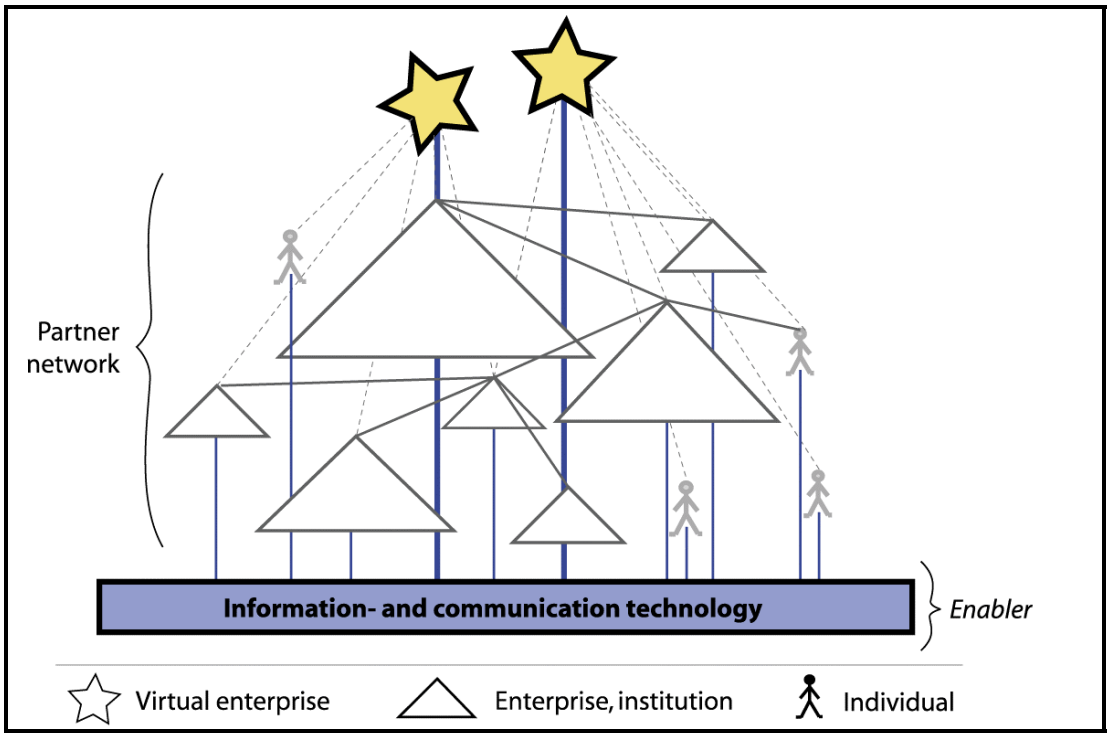


**Figure 10: Economic-technical dimension in relation to virtual enterprises**

Finally, it can be said that the technical dimension of this diploma thesis is theoretically true: ***Open source software in combination with the Internet can provide the technical basis for virtual enterprises at low cost.***

# 4. Social dimension

## 4.1. Introduction

The discussion about virtual enterprises and -organizations is generally done by graduates in business management (economic dimension) or computer scientists (technical dimension). The business people look especially at the new economic structures and do, for example, transaction cost analysis in order to be able to distinguish the virtual organizations from other forms of organizations whereas the computer scientists especially look at the information and communication technology and, for example, create new groupware applications. What can be seen in the following chapters, however, is that the social dimension is at least as important as the economic and technical dimension (cf. Fuderholz, 1998).

## 4.2. The autonomous partner and the information broker

### 4.2.1. General

For the efficient use of the new potentials of the virtual enterprises it is of great importance to look at the social dimension of it and therefore at the roles of the people concerned (cf. Picot/Reichwald/Wigand, 1996). “The role mediates between an independent individual and his or her expected behaviour in the group.” In larger organizations roles tend to be related to titles, written job descriptions or contracts. Roles are of great importance in projects because through them it becomes clearer for the team who has what role and which tasks. Roles translate somehow between “me” and “we” (Lipnack / Stamps 2000, p. 173).

The main roles in relation to virtual enterprises are that of the autonomous partner and that of the information broker. To analyze them they are in the following related to the working forms that appear.

## 4.2.2. Working forms

### 4.2.2.1. General

The following figure gives an overview of the working forms that appear in relation to virtual enterprises:

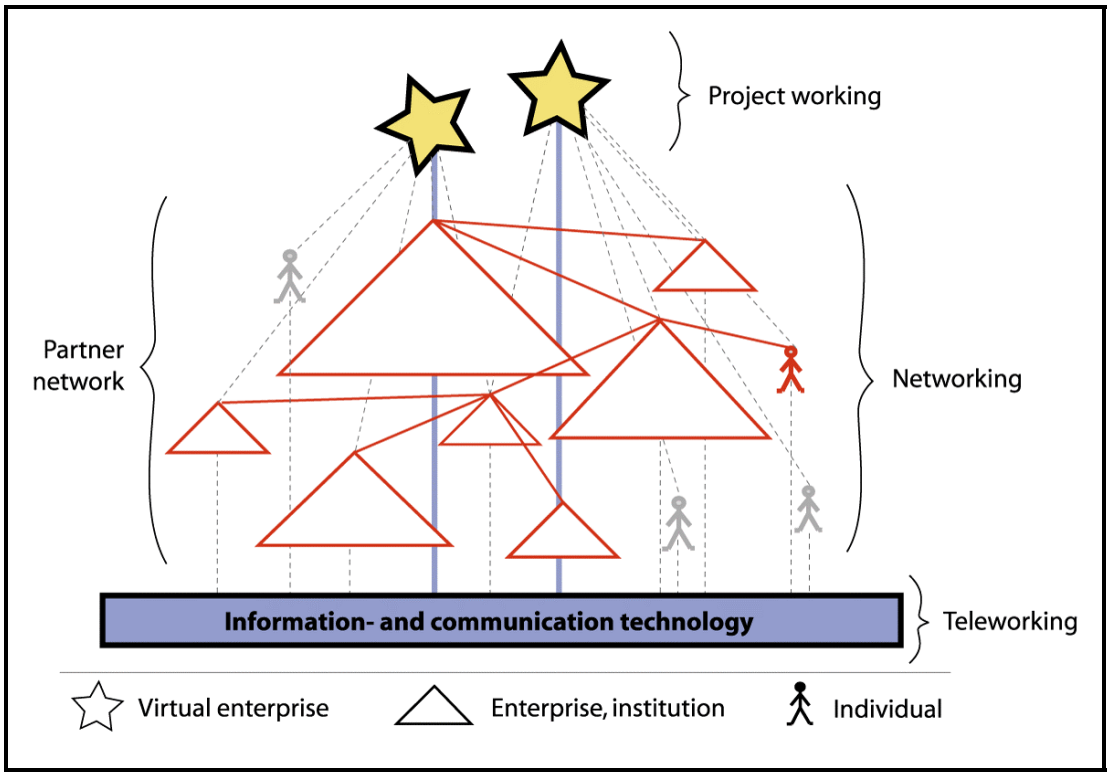


**Figure 11: Working forms in relation to virtual enterprises**

### 4.2.2.2. Project working

The virtual enterprise is a project organization (refer to 1.3.The life of the virtual enterprise) and therefore the working on the project or the yet called project working can be regarded as a form of work within the virtual enterprise.

#### 4.2.2.3. Networking

Virtual enterprises are created out of or create a partner network (see 1.2. Characteristics of the virtual enterprise). The broader concept of the virtual organization now also includes a stable partner network out of which virtual enterprises are created (see C.3.4. Virtual organization versus virtual enterprise). Thus work is related to a partner network and thus networking becomes a relevant form of work regarding virtual enterprises.

#### 4.2.2.4. Teleworking

In virtual enterprises the partners are enabled by the information and communication technology to do their work (see 3. Technical dimension). Therefore teleworking becomes a necessary form of work in virtual enterprises.

A definition of teleworking is given by Zorn which works on the criteria that differentiates teleworking from other forms of work. The resulting attributes of it are as follows:

- There is an online or telephone connection between the working place of the teleworker and the server or telephone station of the enterprise
- The working place can be chosen freely
- The working time can be chosen freely
- Half of the time the teleworker is not physically present in the enterprise

(Cf. Zorn: Telearbeit, eine neue Arbeitskultur. 1997. Quoted in Orlikowski, 2001, p. 9).

### 4.2.3. The role of the autonomous partner

#### 4.2.3.1. The individual as the starting point

As shown in the introduction, organizations nowadays profit from virtual structures where small entities become the starting point to create dynamic virtual enterprises for the different missions (see C.2.3. Centralization and virtualization).

The smallest entity in the virtual structure can be regarded as the molecule. In physics the molecule is defined as the smallest part of a substance but with still having the chemical identity of the substance. Some organic compounds which are called liquid cristals now combine the characteristics of liquids with those of solid materials. Such a structure of molecules is called a cluster. A cluster now can move and change very fast but at the same time it does not lose its defined structure.

This analogy describes the idea beyond the virtual structures with their molecular or virtual structures too: The organizational parts of one or more enterprises are cut into small pieces and now replaced by a dynamic cluster of molecules which can be used to build all imaginable structures dynamically, flexibly and fast, like, for example, the structure of a virtual enterprise.

As already said the molecule is regarded as the smallest element of the cluster or network. When looking at this smallest element or molecule precisely one can see that the molecule is the single person - the individual. In the virtual or molecular structure of the virtual enterprise now the individual becomes the starting point for projects (cf. Tapscott, 1997).

The enterprises partners in the virtual enterprise are autonomous. Consequently, the single molecules of them also - the individuals, become autonomous (see C.2.3. Centralization and virtualization). Looking at the circumstance that the single person becomes an autonomous partner, one can suspect that new knowledge and skills are needed from them, but on the other hand new chances may arise for them too. The following chapters will deal with these predictions.

#### 4.2.3.2. The project working

The autonomous partner needs to do a part of the management by him/herself when looking at the fact that he/she has to solve a part of the mission autonomously. This affects the management of the planning, decision making and controlling. Therefore, the autonomous partner needs decision making powers and thus he takes over the related responsibilities as well (cf. Picot et al., 1996).

A summary of the competences that as a result, are needed from the autonomous partner could be as follows:

- Skills in the management of his/her tasks such as planning or decision making and self-management
- Skills in the management of himself/herself which includes self motivation and self-discipline (cf. Picot et al., 1996)
- Communication competences in order to be able to give and receive the necessary information (cf. Gignac 2005, Picot et al., 1996)
- Social competences to be able to take part in negotiations, solve social conflicts and to be able to cope with stress (cf. ibid.)
- Decision and problem solving competences to recognize problems and look for alternatives (cf. ibid.)
- Core competences that are associated with the tasks that should be solved so that the overall mission can be fulfilled (cf. ibid.)

These needed competences show that highly qualified autonomous partners are needed to realise virtual enterprises (cf. Boyett/Conn: Workplace 2000, New York. 1992. Quoted in Picot et al., 1996, p. 453)

#### 4.2.3.3. The networking

When there is no virtual enterprise to which the autonomous partner belongs he/she may still participate to the partner network if there is one. This can be done by communicating with experts in the network, giving advices for other

virtual enterprises that are currently active or just giving comments to the information available in the partner network to increase the quality of it. He/she may also take part in the community actions and therefore helps to strengthen the culture of the network (cf. Picot et al., 1996).

#### 4.2.3.4. The teleworking

The autonomous partner takes part in the virtual enterprises on a technical basis. The needed competences of the autonomous partner regarding the teleworking aspect are summarized in the following list:

- Competences in using the implemented information and communication technology (cf. Gignac, 2005)
- Open mindness regarding computers and the teleworking aspect.
- By teleworking the partner has a relatively isolated position regarding the possibility of a personal relationship with the other workers or the ability of to solve tasks with them. Therefore, especially for the solving of the tasks, he/she generally needs to be able to motivate himself/herself.
- Ability to cope with the distance to the other participants.
- In general, the partner also needs the competences that were mentioned in the project working chapter above (like self discipline, self control, etc.).

(Cf. Picot et al., 1996).

One must at this point say that due to the teleworking aspect a considerable degree of social conflicts may arise (cf. Rolf, 1998). The main reason for those conflicts is that the formal identification characteristics of the *normal* enterprise are completely missing (cf. Fuderholz, 1998). Therefore a higher structure building concept can be positive which the partner can identify with (see 4.6.5.4. Mission statement).

## 4.2.4. The role of the information broker

### 4.2.4.1. The project working

#### 4.2.4.1.1. General

In the chapters of the role of the autonomous partners above, it has been shown that the individual is the starting point regarding the virtual or molecular forms of the organization. As a result, responsibilities and decision making capacities are being transferred to the autonomous partners. Thus the central management is replaced by great parts of self-management. The partners are somehow *empowered* to work autonomously (cf. Picot et al., 1996).

As a result, the individual and his/her behaviour move into the centre of the business management viewpoint because the individual becomes the most important critical factor. (cf. Reichwald/Hesch: Der Mensch als Produktionsfaktor oder Träger ganzheitlicher Produktion? München. 1993. Quoted in Picot et al., 1996, p. 453).

Managers who work with the new structures see the individuals as the smallest and most important factor. The individual is seen as an *enterprise within the enterprise* (cf. Picot et al., 1996). Each individual, each autonomous partner, is somehow his/her own boss (cf. Gerken, 1990).

As a result, the information broker, however, has to face an existential problem: The information broker can only trust the autonomous partners to act properly but he cannot control them in the traditional way (cf. Nerdinger/Rosenstiel. 1998. Quoted in Orlikowski, 2001, p. 119). The computer takes somehow care that hierarchy and status are more and more inefficient (Gerken 1990, p. 387).

The information broker has to coordinate the project work in virtual enterprises and he has to find management strategies that can cope with the new challenging circumstances. The following strategies are regarded as being effective in supporting the responsible manager:

- **Management by objectives:** In practice it has been shown that strategies that look at the aims of the partners in relation to the overall objectives are effective. In this context the term *management by objectives* is commonly used. Applying *management by objectives* the managers and the partners together set the aims that should be reached in a cooperative way. As a result there are commonly agreed objectives of both, the information broker as well as the autonomous partner. Therefore the autonomous partner binds himself/herself to the aims including the tasks and thus takes over the responsibility of solving them (cf. Gerken, 1990).

  The checking of the tasks is finally done in a cooperative way too in the form of feedback discussions (cf. Orlikowski, 2001). Management by objectives can be a good beginning for a decentral management which is emancipatory and non-authoritarian and fits the needs of the virtual enterprise structure (cf. ibid).

- **The manager as a coach**: Due to the fact that the information broker has to trust the autonomous partner, he has to focus his/her attention on him/her and not his/her tasks. He is somehow getting a coach for them. He has to be a leader without leading in the sense of giving orders (cf. Gerken, 1990). Furthermore, he should give advice and support the partners and look after a common understanding of the vision and mission. The manager should establish a climate of social cooperation that is characterized by social balance and a consensus between the partners (cf. Orlikowski, 2001). A cooperative authority is given when the manager tries to help and support the process of creating a team (cf. Gerken, 1990).

- **Bonus system**: The autonomous partners take over a lot of responsibility and, as a result, a simple salary will not be a great motivation for them to work hard for the mission. Therefore the information broker can implement a bonus system so that the autonomous partners are motivated to do their work well. With this strategy a relation is created between working performance and payment (cf. Orlikowski, 2001, Picot et al., 1996).

- **The meaning of work**: Self-organization of the molecules, individuals or as here called autonomous partners is becoming a prerequisite of the virtual enterprise (cf. Gerken, 1990). For that reason the partners have to realize that their autonomous work, competences and creativity are of enormous importance for the virtual enterprise (cf. Boyett/Conn: Workplace 2000, New York. 1992. Quoted in Picot et al., 1996, p. 453). To support the self-organization of the partners a meaning related to the mission could create productivity and even passion (cf. Gerken, 1990).

To sum up, one can see that the above mentioned management strategies that can be used by the information broker have a great human and social dimension.

#### 4.2.4.2. The networking

What becomes important in the partner network is the new dimension of management. Next to the single enterprise, the network becomes the reference point for the question "*who is responsible for what"* and *"who can do what"*. The questions of the management now do not only concern the outsourcing or including of economic activities but also the questions which functions are perceived by the network and how the relations in the network are arranged. The tasks of the management, like planning or organising become an inter-organizational character. Thus modern relationships

between organizations increasingly have the same characteristics like former intra-organizational relationships (cf. Winand et al., 1998).
Looking at the partner network out of which virtual enterprises can be created the social dimension becomes of great importance. An enterprise which wants to become an information broker for different virtual enterprises now has to build up some kind of personal partner network where it cares about personal relationships (cf. Pinchot/Pinchot: The End of Bureaucracy and the Rise of the intelligent organization. 1993. Quoted in Picot et al., 1996, p. 460). If he does not he cannot use the advantages of the partner network (see 2.4.1. Advantages of the partner network).

The following tasks should be done by an information broker:

- Generating and putting through a strategic vision for the network
- Building virtual enterprises
- Finding experts and creating a relationship with them
- Provide network wide access to relevant information about the partners and the general information of the partner network
- Exchanging employees in the network
- Establishing a social and economic culture for the network

To sum up, the creation and maintenance of relationships on a social level is important in the partner network (Picot et al. 1996, p. 460).

#### 4.2.4.3. The teleworking

Great parts of virtual enterprises are likely to be done in the form of teleworking. Now the leading of teleworkers is a great challenge for the information broker because the teleworker is not physically there. For that reason, the social dimension of the relationship can be seen as critical.
The manager has the challenge to create a social feeling of participation regarding the teleworker. The aim is that the teleworker looks at him/her as a part of the virtual enterprise. This can be reached by continuous meetings

with the teleworkers where a personal social dimension may be created (cf. Reichwald/Hermens: Telekooperation und Telearbeit. 1994. Quoted in Picot et al., 1996, p. 460).
Looking at those social aspects, it can be assumed that the strategies of the project working, like management by objectives or the creation of a meaning beyond the work can be used to deal with the problems regarding the teleworking too (see 4.2.4.1. The project working).

#### 4.2.4.4. Result

The final question for the information broker could be: What comes first – the work or the people? In the chapters above it has been shown that the information broker is carried by the autonomous partners and his/her chance is to receive the power through sharing it in a cooperative way (cf. ibid). An aim that lies even beyond this idea could be the so called *cultured corporation*: not managing for a social system but as a social system (cf. Gerken, 1990).

## 4.3. The importance of trust

As seen in the chapters above virtual enterprises are based on trust in the sense of reliability. Davidow and Malone even say that trust is the determining sign of them (cf. Davidow et al., 1997). However, trust cannot be demanded but needs to be earned on a human and social dimension. Finally trust is positively affected by shared values (cf. Mayer et al., 1998). If there is a similar view of the world in general then there will also be a kind of similarity between the partners. On this basis cooperation between them becomes less risky because the complexity of the social world is being reduced. On the other hand, however, this system restricts the individual flexibility of the actors. (cf. Fuderholz, 1998)
The idea to use trust as the basis for business, is a need of the *virtual managers* at the end of the 20$^{th}$ century and, in fact, it brings back old values into the world of business (cf. Mayer et al., 1998).

## 4.4. The importance of culture

The building of the basis for economic cooperation like in virtual enterprises is very complex. The modern economic theories, models and some beginnings of the economic sciences are not enough yet to find the mechanisms that are responsible for the quality of the cooperation. One can however say that it is necessary that people who interact with each other need a common culture or should create one. Shared values have to be present in order to be able to set up something together, especially in virtual enterprises (cf. Fuderholz, 1998).

Creating a culture in one single enterprise is regarded as being complex. The main problem regarding the virtual organization with its different partners now seems to be that creating a culture for all of them is even more complex than in a single enterprise. One can suspect that the concept of culture in one single enterprise needs to give way to a concept of a culture that is based on a higher structure building concept (cf. Fuderholz, 1998).

“Culture is primarily a force, which provides direction. […] Culture is, after all, the vitality, which provides sense. In this regard its symbolic dimension (values, spirituality, etc) plays a crucial role. This search for sense is not only an individual activity. It is also collective and encroaches on the political: co-existing, social relationships, which in this time of fragmentation and change are often of a new kind, or need to be re-established.” (Verhelst 1994, p. 2)

Looking at the circumstance that shared values are also a positive factor in creating an atmosphere of trust, it can be said that the culture becomes an important thing in virtual enterprises. It is even said that the continuous forming of virtual enterprises out of the virtual organization is not a main concept of the structure but a concept of a common culture (cf. Fuderholz, 1998).

## 4.5. System self-organization

At this point it should be discussed whether the system *virtual enterprise* is a self-organizing system. Self-organization means the sum of the processes that are created by the system itself. Moreover, within the system itself order is created, improved or preserved. The self-organization and its ability to create order without a central decision point is of importance regarding the virtual enterprises because, as shown above, there is no central decision point due to the decentralized structure (cf. Fuderholz, 1998).

There are four fundamental characteristics of self-organization which are autonomy, complexity, redundancy and self-reference. In the following table those characteristics are related to the system *virtual enterprise*.

| **Self-organizing systems** | **Virtual enterprise** |
|---|---|
| **Autonomy** | |
| Self-regulation | yes |
| Management related scope for action | yes |
| Minimal specification | Yes |
| No unchangeable dependences between tasks, working conditions, possible solutions, working forms | Yes |
| Lose coupled systems | Yes |
| **Redundancy** | |
| Repeated qualifications | Not really – especially core competences are focused |
| Maintanance of the capacity to act | Yes |
| Creation of decentralized management competences | Yes |
| Supply with necessary organs regarding the system | Yes |

| | |
|---|---|
| Variety of qualifications | Not really - only those qualifications which are necessary to fulfill the mission |
| **Complexity** | |
| Development of “closed” task complexes | Yes |
| Management areas are kept to a great extent | Yes |
| Synchronous managing of different dimensions (economic and social demands) | Yes |
| Maintenance and cultivation of relationships and interactions | Yes |
| **Self-Reference** | |
| Meaningful mission statement | Yes |
| Synergetic task completion | Yes |
| Team-orientated management and forms of cooperation | Yes |
| Learning and learning to learn through activities on the working place | Yes |
| Self-shaping, self-management, self-development | But not as a closed system |

(cf. Scholz: Die virtuelle Organisation als Strukturkonzept der Zukunft? 1994. Quoted in Fuderholz, 1998, p. 26)

Considering the factors described above, self-organization becomes one of the basic characteristics of virtual enterprises. Again one can draw conclusions from this fact in respect of the needed social dimension and culture: The partners in the organization have to manage themselves, they

have to be trustworthy to each other, they have to be able to understand the roles of the others, they must be able to live with irregularities and they have to look to finding a balance between working and self-management.

## 4.6. The open source partner network

### 4.6.1. General

Looking at the open source partner network and its open source projects, one can see that the organization of it looks like a virtual organization. What, therefore, becomes very interesting is that the culture of the open source partner network is so strong that thousands of self-organized virtual enterprises arise from it.
In the next chapters the open source phenomenon will be examined which should finally give insights into the characteristics of its strong culture so that these insights may be used to positively influence other virtual enterprises too.

### 4.6.2. Virtual enterprises versus open source projects

First of all, it will be shown that open source projects have the same characteristics as virtual enterprises. Therefore, in the following list, firstly the characteristics of the virtual enterprise are mentioned and then compared to the characteristics of an open source project.

1. The virtual enterprise is a project organization of partners with one mission
   → An open source project is also a project organization. At first there is an idea or innovation and afterwards some partners start a mission to fulfill this idea or innovation (cf. Sauerburger, 2004).
2. The partners bring in their core competences
   → Compared to an open source project the partners also concentrate on those tasks which they can solve best considering their know-how and skills (cf. ibid.).

3. The partners are legally independent

   → The partners who participate in open source projects are legally independent because there are usually no contracts in the open source partner network.
4. The virtual enterprise is created out of or creates a partner network

   → The open source community can be seen as the partner network out of which the open source projects arise (cf. ibid.).
5. An information broker coordinates the project

   → Compared to an open source project there is also a single person or a group that coordinates the project (cf. ibid.).
6. The stakeholders are included

   → In an open source project everybody is welcome to participate in the development and contribute to it with proposals, changes or fixes (cf. ibid.).
7. The partners use information and communication technology for their decentralized work

   → The partners use the Internet and open source software for their decentralized work (this is the same technical dimension like proposed in this work, see 3.Technical dimension).
8. The partners act autonomously

   → The partners that participate in an open source project can be spread all over the world and work autonomously to fulfill the missions (cf. ibid.).
9. The cooperation is based on trust

   → Everybody may contribute to a project or not. There are usually no contracts and every partner may stop working on the project. Therefore the cooperation is based on trust.
10. Self-organization is being supported

    → While an open source product is created the partners work autonomously and organize themselves alone. Thus self-organization is being supported.

### 4.6.3. Similarities

In the chapters above it has been shown that the typical open source projects have atypical characteristics of virtual enterprises. Therefore the open source partner network or the open source community can be regarded as a good example for a partner network out of which self-organized virtual enterprises arise.

### 4.6.4. Differences

It could be argued that one main difference compared to non-software orientated virtual enterprises is that the partners in open source projects usually do not sell the products and thus are not dependent on each other from an economic viewpoint. Furthermore, the time for an open source project may be long lasting because the work is usually not linked to a time table with deadlines.

On the other hand however, the Boston Consulting Group made a survey about the autonomous partners that participate in open source projects hosted by one of the greatest open source platforms called Sourceforge. The survey showed that about 40% of the open source software is already made in the main jobs of the partners (cf. Lakhani/Wolf/Bates/DiBona: Hacker Survey vo. 73. 2002. Quoted in Sauerburger, 2004, p. 88). Therefore, an economic dimension is related to open source in general as well.

### 4.6.5. Culture of the open source partner network

#### 4.6.5.1. General

As already said, the open source partner network manages to work on the basis of a strong culture that supports self-organization. Thousands of motivated partners participate in the network and work in virtual enterprises to create and improve the open source products – even if they usually receive no money.

Therefore, in the next chapters the motivation factors will be analyzed that will lead to an analysis of the underlying culture.

### 4.6.5.2. Motivation factors

The following figure gives an insight to the reasons for the motivation of the partners who participate in open source projects:

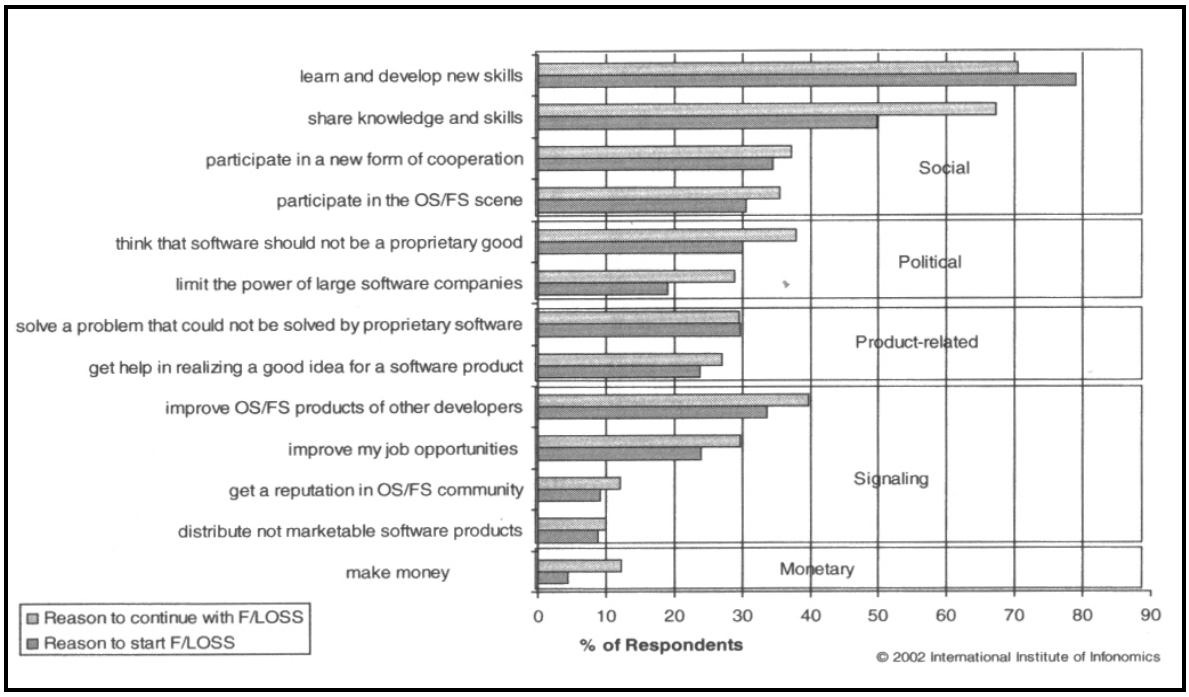


**Figure 12: Motivation for the contribution to open source projects (Floss- Report - Survey of user organizations. Http://www.flossproject.org/report. Quoted in Sauerburger, 2004, p. 18)**

**Social dimension**: Looking at the figure above, the social dimension can be regarded as the most important dimension for the partners. The factors “learn and develop new skills”, “share knowledge and skills”, “participate in a new form of cooperation” and “participate in the open source scene” are highly motivating for the autonomous partners.

**Political**: The motivating factors “think that software should not be a proprietary good” and “limit the power of large software companies” indicate that a driving power of open source projects is a politically motivated one.

**Product-related**: A product related motivation is given through the factors “solve a problem that could not be solved by proprietary software” and “get help in realizing a good idea for a software product”.

**Signaling**: The signaling factors are “improve open source products of other

developers", "improve my job opportunities" or "get a reputation in the open source community" and "distribute not marketable software products". This motivates the autonomous partners because they get the chance to look good in the open source community or to get a career in the open source industry.

**Monetary**: Last but not least the factor "making money" is a relatively moderate motivation factor.

A lot of the motivation factors in the above chapter are related to the licensing politics of the open source software. Therefore they should be introduced in the following chapter.

#### 4.6.5.3. Licensing politics

The licensing politics go back to 1984 when Richard Stallman founded the *Free Software Foundation*. He laid down some new rules for the licensing of the produced software which he wrote down in the GNU license (www.gnu.org/gnu/) to which most of the open source software relates to. The fact that the source code is freely available to other interested and autonomous programmers - allowing them to improve upon it - is central to the open source philosophy.

The open source definition of the *Open Software Initiative* includes the following:

- The source code must be distributed with the software or otherwise made available for no more than the cost of distribution.
- Anyone may redistribute the software for free, without owing royalties or licensing fees to the author.
- Anyone may modify the software or derive other software from it and then distribute the software under the same terms.

(cf. Sauerburger, 2004)

#### 4.6.5.4. Mission statement

The licensing politics mentioned above which represent the open source philosophy have to be accepted by all the partners. Each open source project needs to be based on those license policies.
It can, however, be seen that the philosophy behind it makes sense for a lot of people and motivates them to join the open source partner network. The motivation factors are “share knowledge and skills”, “think that proprietary software should not be a proprietary good”, “limit the power of large software companies”, “solve a problem that could not be solved by proprietary software”, “get help in realizing a good idea for a software product”, “improve open source products of other developers” and “distribute not marketable software products”.

Regarding virtual enterprises and their cultures in general, it was said that the concept of culture of one single enterprise needs to give way to a concept where the culture is based on a higher structure building concept that unites all the partners in the partner network. Therefore, shared basic values need to be there which should make sense for the partners and provide a direction and a meaning for the work (see 4.4. The importance of culture).
Looking at the licensing policies of the open source partner network, one can see that these policies are the higher structure building concept that creates the strong culture in the open source partner network. The licensing politics set the rules that have to be accepted by all participants but also includes the values that are shared by the so called open source community.

#### 4.6.5.5. The open source community

The phrase *open source community* already indicates that the community factor plays an important role in the open source partner network. One can see that the motivation factors which are related to the community idea have the most power. Therefore, the community factor becomes the most important motivation force by including the following motivation factors: “share knowledge and skills”, “participate in a new form of cooperation”,

“participate in the open source scene” and “get a reputation in the open source community”.

Finally, it can be said that the open source network is based on a pattern that is needed for an effective community network: “Birds of a feather flock together: nodes link together because of *common attributes*, *goals or governance*.” (Krebs/Holley 2002, p. 3). One can also say that shared values and the mission statement bring them together in the partner network.

### 4.6.6. Result

The example of the open source community showed that the culture can be supported by a mission statement that the partners in the network share. Therefore the partner network becomes a community network and motivation factors may arise out of the mission statement.

## 4.7. Overall result

In the social dimension it could be seen that the partners in virtual enterprises have to work autonomously because they work in decentralized way. Therefore the information broker has to trust the autonomous partners and needs to *empower* them. The following comparison illustrates this again:

The old technology model was based on mainframes where all the power was concentrated at one point and at the same way the management was mainly centered in some points of the organization. However, in the century of the connected intelligence where virtual enterprises try to collect know-how from decentralized partners also management must be spread out. This is, however, the antithesis of the old hierarchical model.

Appropriate management should be an interconnected, virtual power which is being derived from a common vision. In the future, visions will probably be made by all stakeholders and also communicated by them all. Corporate leadership in teams is created through common acting of individuals who work on the realization of a vision or solving of a problem (cf. Tapscott, 1997).

It has been shown that the risk beyond trust is reduced by shared values and therefore shared values become important for the partners. An example of shared values that create a powerful partner network can be found in the open source community. It was furthermore shown that these shared values derive out of a mission statement that unites the partners and motivates them. As a result, self-organization is being supported in the virtual enterprises of the open source community indeed. However, one has to argue that the economic aspect in this example is less important.

To sum up, the following figure illustrates the role of the social dimension in relation to virtual enterprises:

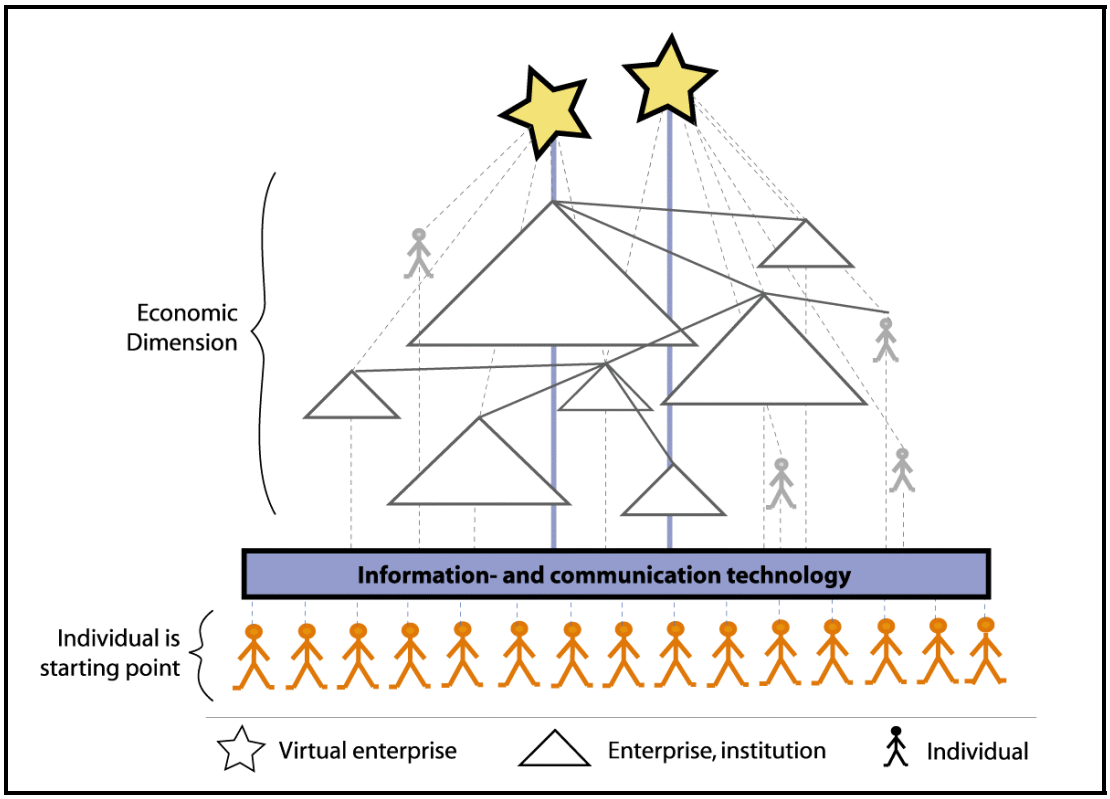


**Figure 13: Economic–technical–social dimension in relation to virtual enterprises**

Finally, it can be said that the social dimension of this diploma thesis is theoretically true: ***The partners in virtual enterprises work self-organized and a mission statement that delivers shared values for them makes the cooperation less risky.***

# E. SUSTAINABLE MANAGEMENT IN VIRTUAL ENTERPRISES

## 1. Introduction

### 1.1. General

The main idea of this thesis is that there is a mission statement with a vision that could unite partners in virtual enterprises and, at the same time, could support the sustainable development: The mission statement is called sustainable management and the vision is called sustainability.

### 1.2. Sustainability

The word sustainability is some hundred years old but it got famous through the publication of the *Conversation Strategy*[i] and the *Brundtland-Report*[ii]. "Sustainability is an ideal end-state. Like democracy, it is a lofty ideal whose perfect realisation eludes us. For this reason, there will always be competing definitions of sustainability. We know these definitions will always include the well-being of people, nature, our economy and our social institutions, working together efficiently over the long-term. But as the process of attempting to achieve sustainability will continuously reveal new challenges and questions – pushing back the horizons as it were – a definitive definition is impossible." (Hauff: Unsere gemeinsame Zukunft, der Brundtland bericht der Weltkommission für Umwelt und Entwicklung. Greven. 1987. Quoted in Priselj 2004, p. 8).

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[i] The World Conservation Strategy was created in 1980. Amongst the participants who wrote it were international environmental organizations like the IUCN (The Conservation Unit) or the WWF (World Wide Fund of Nature) as well as UN-Organizations like UNEP (United Nations Environment Programme).

[ii] In the year 1987 a report called "Our common future" was written by a special commission of the UN. The report is a critical analysis and expounded the problems of the development and the environment. It contributed to the spreading of the phrase *sustainable development*. The committee was lead by the Norwegien prime minister Gro Harlem Brundtland.

Despite that there is no overall definition of sustainability the concept of it usually includes three dimensions: an economic dimension, a social dimension and an ecological dimension (cf. Priselj, 2004).

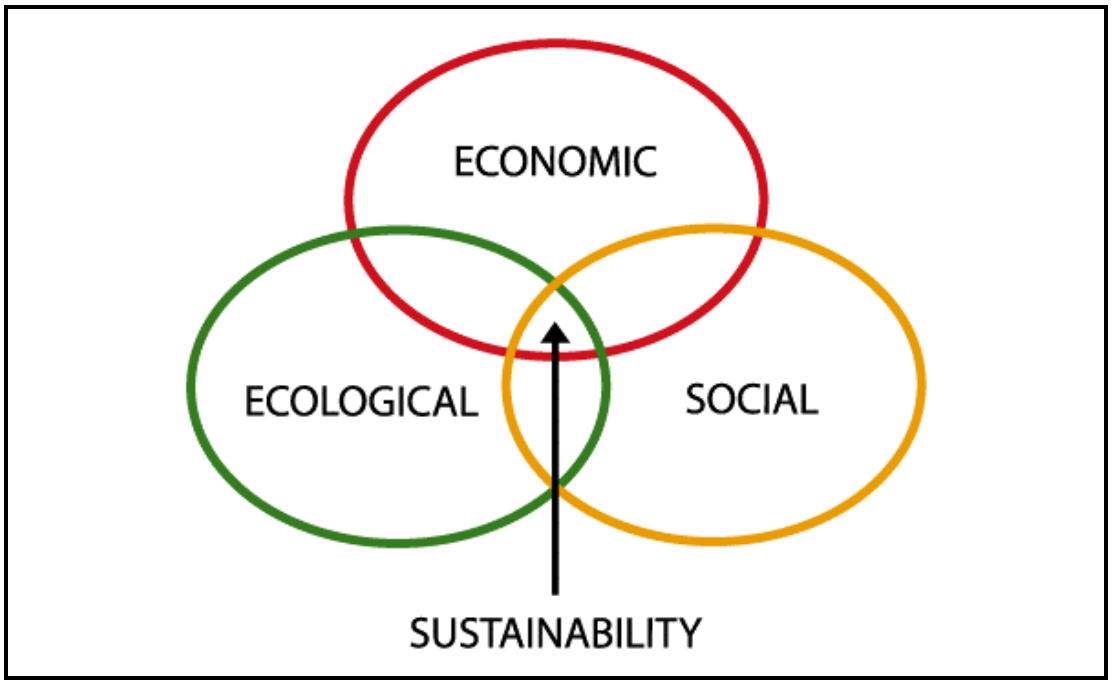


**Figure 14: Dimensions and intersections of sustainability (cf. Hauth/Raupach: Nachhaltigkeitsberichte schaffen vertrauen. In: Harvard Business Manager. Nr. 5/2001. Quoted in Hauer, 2003, p. 12)**

## 1.3. Sustainable development

Sustainability is the vision of an economic-social-ecological well-being. This vision can be applied by a sustainable development of the world which means that the world develops towards sustainability.

A sustainable development can be supported by generally setting sustainable aims, planning by looking at the sustainability, making decisions that look at all of the sustainable dimensions, act in a sustainable way and finally control if sustainable development is really being supported. Therefore some well-directed action needs to be done by different groups of people.

## 1.4. Sustainable management

Like sustainability also sustainable management can be interpretated in different ways. For this thesis a simple definition will be given that derives from the meaning of the word *management* in combination with the three dimensions of sustainability.

The phrase management can be seen from an institutional viewpoint where the people who manage, and therefore the managers, are meant. It can also be seen from a functional viewpoint where the management process is meant. The management process involves the following steps:

- Objectives
- Planning
- Decisions
- Execution
- Control

Additionally, each step needs relevant information and communication (cf. Wikipedia, 2005, http://www.wikipedia.org/)

If one combines the two viewpoints and relates them to the three dimensions of sustainability, the following definition of sustainable management results:
*Sustainable management is when managers include all three dimensions of sustainability by doing the management process. This means that the setting of the objectives, the planning, the decision making, the carrying out and the controlling are done from an economic point of view, from a social point of view and an ecological one.*

Looking at the definition above, sustainable management is a management method that needs to be realized by including different viewpoints. As a result, there cannot be a single sustainable manager. Only different groups of people that represent the different viewpoints can together make sustainable management.

Looking at the sustainable development with its need for well-directed action by groups of different people, it can be seen that sustainable management now supports sustainable development.

# 2. Sustainable innovation networks

## 2.1. General

To sum up the above chapters, the vision of sustainability is brought closer by a sustainable development and sustainable development is supported by sustainable management.

However, “if development is to be truly sustainable, we need to explore new avenues of development that overcome traditional patterns” (Deutscher Bundestag 1998. Quoted in: Kirsten, 2005, p. 135). But how can new patterns be implemented which focus on an interconnective approach? “Innovations may provide important modules in this respect. […] innovations that are claimed to contribute to sustainable development need to combine ecological, economic and social targets. ” (ibid.) Therefore “one constitutive characteristic of sustainable innovation networks is cooperation on innovations that simultaneously represent economic progress, reduce the burden on the environment and adequately respect social considerations. It is this combination of the three dimensions that enables these innovations to contribute to sustainable development. Such innovations include not only new products, services and processes, but also social, organizational, institutional, system-orientated and needs-orientated innovations.” (Kirsten 2005, p. 137)

“Inter-organizational dialogue on innovation (e.g. between businesses, clients, suppliers, research institutes, political institutions, NGOs and the general public) would also appear necessary, since aside from allowing stakeholders’ respective problems and needs to be taken into account, it is also important for the social acceptance of a sustainable innovation” (Heidenreich, 1997. Quoted in Kirsten 2005, p. 134).

The next figure distinguishes the sustainable innovation network from other forms of networks that deal with similar aims:

| | *Examples* | *Aims* | | | |
|---|---|---|---|---|---|
| | | *Innovations* | *Economic* | *Ecological* | *Social* |
| Innovation networks | Product-development networks | X | X | | |
| Ecologically orientated networks | Environmental-management networks, eco-industrial parks | X | X | X | |
| Sustainable networks | Local agenda 21 networks | | X | X | X |
| Social networks | Local exchange trading systems | | X | | X |
| *Sustainable innovation networks* | | *X* | *X* | *X* | *X* |

**Figure 15: Comparison of the aims of different types of networks (cf. ibid.)**

## 2.2. Opportunities and risks

### 2.2.1. General

In the following figure, the opportunities and the risks of sustainable innovation networks are shown:

| *Opportunities* | *Risks* |
|---|---|
| • Sharing innovation risks and costs<br>• Joint usage of resources<br>• High degree of flexibility<br>• Increased potential for tackling complexity<br>• Mutual learning processes<br>• Development of common knowledge<br>• Development of sustainable, network-specific core competences<br>• Time-savings from tackling different aspects simultaneously<br>• Greater likelihood of the innovation's diffusion | • Out-learning, knowledge drain, loss of core competences<br>• Increased transparency for network members<br>• Considerable coordination costs<br>• Dependencies, reduced autonomy of individual stakeholders<br>• Loss of autonomy<br>• Risk of lock-in effects |

**Figure 16: Opportunities and risks of sustainable innovation networks (cf. ibid.)**

### 2.2.2. Opportunities

**Sharing innovation risks and costs:** For small and medium sized enterprises in particular the possibility of sharing the risks and costs can make sustainable innovation projects possible by including missing competences through the partners.

**Joint usage of resources:** All the partners that invest in the network can usually use these resources together.

**High degree of flexibility:** Because the investments for the network are shared the single partner stays flexible.

**Increased potential for tackling complexity:** Due to the different competences of the partners and the shared resources, the partners can deal with more complex issues.

**Mutual learning process:** In the cooperation process the partners may learn from each other.

**Development of common knowledge:** Regarding the partner network the partners may create a knowledge base together which provides useful information.

**Time-savings from tackling different aspects simultaneously:** The processes for creating the innovation can be concurrently fulfilled rather than one after the other.

**Greater likelihood of the innovation's success:** The important time-savings in the accomplishing of the sustainable innovation also improve the likelihood of the sustainable innovation project being successful.

(cf. ibid.)

### 2.2.3. Risks

**Out-learning, knowledge drain, loss of core competences:** Due to the learning effects in the network a partner may lose research and development competences.

**Increased transparency for network members:** Due to the higher transparency between the partners, the danger arises that secrets of one partner become known in the network and can be used after the network has

vanished to the disadvantage of this partner.

**Considerable coordination costs:** Because of the close liaison among the partners the transaction costs may considerably increase.

**Dependencies, reduced autonomy of individual stakeholders:** The allocation of tasks may lead to dependencies upon the partners.

**Loss of autonomy:** The loss of autonomy may result from the above risk too.

**Risk of lock-in effects:** A tendency of long-lasting partner networks to cut themselves off can be seen. One reason for this perhaps is that considerable costs have been already invested to belong to the network or that hardening structures may lock-in the partners.

(cf. ibid.)

### 2.2.4. Result

"The conceptual framework of sustainable innovation networks seems to be particularly suitable for the development and diffusion of ecological, economic and social innovations." (ibid. p. 140). However empirical observations have shown that at present there have not yet been that many sustainable innovations and that sustainable innovation networks are not wide spread (cf. ibid.).

Looking at the risks of sustainable innovation networks the factor "considerable coordination costs" seems to be the most critical factor. The reason is that if one looks at the fact that the stakeholders may be enterprises, research institutions, local authority departments, clients, suppliers, political institutions, NGOs and also the general public, the costs that may arise to coordinate all the people are likely to explode. Therefore "one extremely useful item would be the development of information and communication platforms." (Kirschten 2005, p. 140)

# 3. Sustainable management in virtual enterprises

## 3.1. General

The need of sustainable innovation networks for information and communication platforms described above leads to the concept of this work, namely *sustainable management in virtual enterprises*. It is the combination of the concept of virtual enterprises with that of sustainable innovation networks.

## 3.2. Virtual enterprises versus sustainable innovation networks

### 3.2.1. Comparison

The concept of sustainable innovation networks has a lot of the characteristics of virtual enterprises. To show the similarities the following list compares the characteristics of the virtual enterprise (see D.1.2. Characteristics of the virtual enterprise) with those of the sustainable innovation network.

1. The virtual enterprise is a project organization of partners with one mission

   → "Sustainable innovation networks are usually project-based, having been set up to jointly tackle some concrete innovation tasks […] Sustainable innovation networks are geared towards solving problems. The aim is to come up with innovative, sustainable solutions to problems under very dynamic environmental conditions, which could not be solved by the individual members alone." (Kirsten 2005, p. 137)

2. The partners bring in their core competences

   → “Depending on the specific problem at hand, the actors bring their specific expertise and also their respective interests into the innovation cooperation. This interdisciplinary cooperation boosts the ability to solve complex problems.” (ibid.)
3. The partners are legally independent

   → “Relations between individual network members change over time, and partners may cooperate within some fields but compete in others.” (ibid., p. 138)
4. The virtual enterprise is created out of or creates a partner network

   → “Once the aims have been achieved (or the project has failed), the temporary network can be completely disbanded or reactivated (possibly with different partners) for a new innovation project. For example, if there is a network pool (Haritz, 2000) to which various innovation-orientated companies loosely belong, some of them (depending on their suitability) may join forces within an institutionalized network in order to tackle a specific innovation project.” (ibid., p. 137)
5. An information broker coordinates the project

   → “One factor, which is particularly important to exploit the network-specific development potential, is explicit network management (Ritter and Gemünden, 1998). Network management is central not only to the selection of suitable network members and innovation projects but also to the allocation of resources, tasks and responsibilities in concrete innovation projects. It is also important to lay down and enforce rules for internal cooperation within the network, such as rules on handling conflicts and contractual agreements (e.g., how profits from innovation success and the protection of individual contributions to innovation are to be shared) as well as rules of knowledge on storage (regulation).” (ibid., p. 143)

6. The stakeholders are included

   → Sustainable innovation networks make innovative projects by combining the economic, social and ecological dimension. Therefore a lot of stakeholders may contribute to a single project so that problems and needs from all dimensions can be taken into account.

7. The partners use information and communication technology for their work

   → It is not defined if the partners use information and communication technology for the work in sustainable innovation networks. However, "one of the key jobs of the management is to organise the intensive exchange of information and communication among the network members." (ibid., p. 143)

8. The partners act autonomously

   → It is not defined if the partners work autonomously in the innovation project or not.

9. The cooperation is based on trust

   → "Accordingly, mutual trust between the network's members is especially important. Trust, including the declared willingness not to seek advantages at the cost of the other members, is fundamental to cooperation. This trust is also able to compensate for time-consuming and expensive hedging measures against possible risks. […] Cooperative (rather than competitive) behaviour patterns tend to predominate in sustainable innovation networks. Cooperation within the network is based on collaboration among the participants in order to achieve advantages (e.g., competitive advantages) or to gain time over competing organizations. However, this is not to say that competitive behaviour is completely ruled out." (ibid., p. 138)

10. Self-organization is being supported

    → It is not defined if self-organization is supported by the partners.

### 3.2.2. Similarities

Looking at the comparison above one can see that virtual enterprises and sustainable innovation networks nearly have the same structure.
Additionally, the innovation factor is important in both: the advantage of a virtual enterprise is that it can be used to solve innovations or it can be used to create innovations (see D.2.6. Creativity and innovations) and sustainable innovation networks focus on innovations in general.
Finally, the opportunities and risks related to the sustainable innovation networks (see 3.2. Virtual enterprises versus sustainable innovation networks) can be also regarded as opportunities and risks of the virtual enterprises by excluding the sustainable dimension of them.

### 3.2.3. Differences

Looking at the comparison above two main differences appear between virtual enterprises and sustainable innovation networks:

1. Sustainable innovation networks are not *enabled* by the information and communication technology. As a result, two related differences appear: it is not said whether the partners work autonomously and if therefore self-organization is being supported.

2. Virtual enterprises do not practice sustainable management.

## 3.3. Sustainable management in virtual enterprises

Sustainable management in virtual enterprises is the combination of the concept of virtual enterprises with that of sustainable innovation networks. As a result of this combination, by looking at the similarities and differences of the concepts, the following (win-win) situation appears:

1. The first result of this combination can be positive for sustainable innovation networks because they now get supported by the

information and communication technology. Therefore the risk of the critical factor “considerable coordination costs” (see D.3.4.3. Administration needs) is being reduced by the information and communication technology.

It has been shown that innovations are a strength of the virtual enterprises and that they may support the development in general (D.2.6. Creativity and innovations). In connection with sustainable management they now may support a sustainable development.

2. The second result can be seen as positive for the virtual enterprises: The autonomous partners in the virtual enterprise have to manage their parts of the mission alone (see D.4. Social dimension). If sustainable management is now done in virtual enterprises it defines how the mission must be managed and, as a result, its values have to be shared values of the partners. Thus sustainable management becomes the mission statement of the partners.

   It has been shown shown that a mission statement unites people that share the values of it (see D.4.6. The open source partner network). As a result, partners need to be found that share the values of sustainability. On the one hand, therefore, the flexibility of choosing the partners is being restricted because all have to agree to the mission statement. On the other hand, however, a similarity between the partners arises on which basis the cooperation becomes less risky (see D.4.3. The importance of trust).

   Additionally, there has been a change in the values of the society with the result that enterprises will have to open their borders to society. Economic behaviour will have to deal with the ethical side of the social dimension. The positive effect of this is that out of the created social meanings and aims of the work, a self-motivation of the partners is created (cf. Gerken, 1990). This self-motivation is a positive factor for the self-organization of virtual enterprises (see D.4.6. The open source partner network).

## 3.4. Sustainable management in Austria

Due to the fact that the partners in virtual enterprises are autonomous and legally independent (see D.1.2. Characteristics of the virtual enterprise) it becomes interesting how the values of the self-employed people look who are most likely to be partners or information brokers of virtual enterprises. The following figure shows the values of self-employed Austrian people:

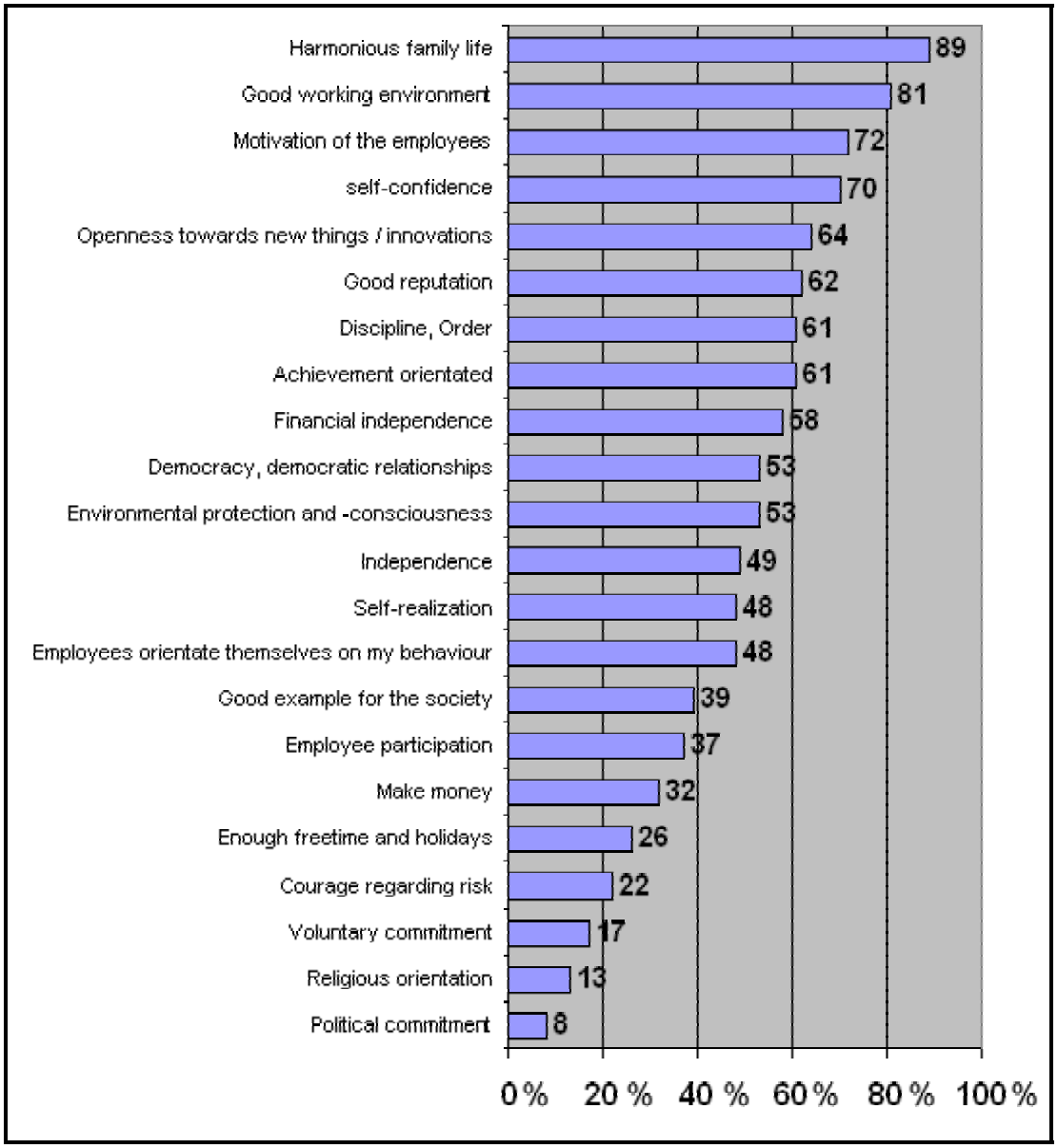


**Figure 17: Values of self-employed Austrian people (cf. Beutelmeyer/Koglgruber: Unternehmensethik in Österreich. 2003. Quoted in Hauer, 2003, p. 10)**

What can be seen in the figure above is that there are shared values amongst self-employed Austrian people in respect of a social dimension, an ecological dimension and an economic dimension. The social dimension is represented by the values “democracy, democratic relationships” (52%) and “motivation of the employees” (72%). The ecological dimension is represented by the value “environmental protection, environmental consciousness” (52%) and the economic dimension is represented by the attribute “making money”.
What stands out again, as in the motivation figure of the open source participants (see D.4.6.5. Culture of the open source partner network), is that the economic side has a moderate importance.

As a result, it can be said that there are shared values amongst self-employed Austrian people related to sustainability.
Thus *sustainable management in virtual enterprises* could theoretically be a uniting mission statement for more than half of the self-employed Austrian people.

# 4. Overall result

The combination of the concept of virtual enterprises with that of sustainable innovation networks leads to the main idea of this thesis, namely *sustainable management in virtual enterprises*. It has been shown that out of this combination a win-win situation may appear.

To sum up, the following figure illustrates the role of the sustainable management in relation to virtual enterprises:

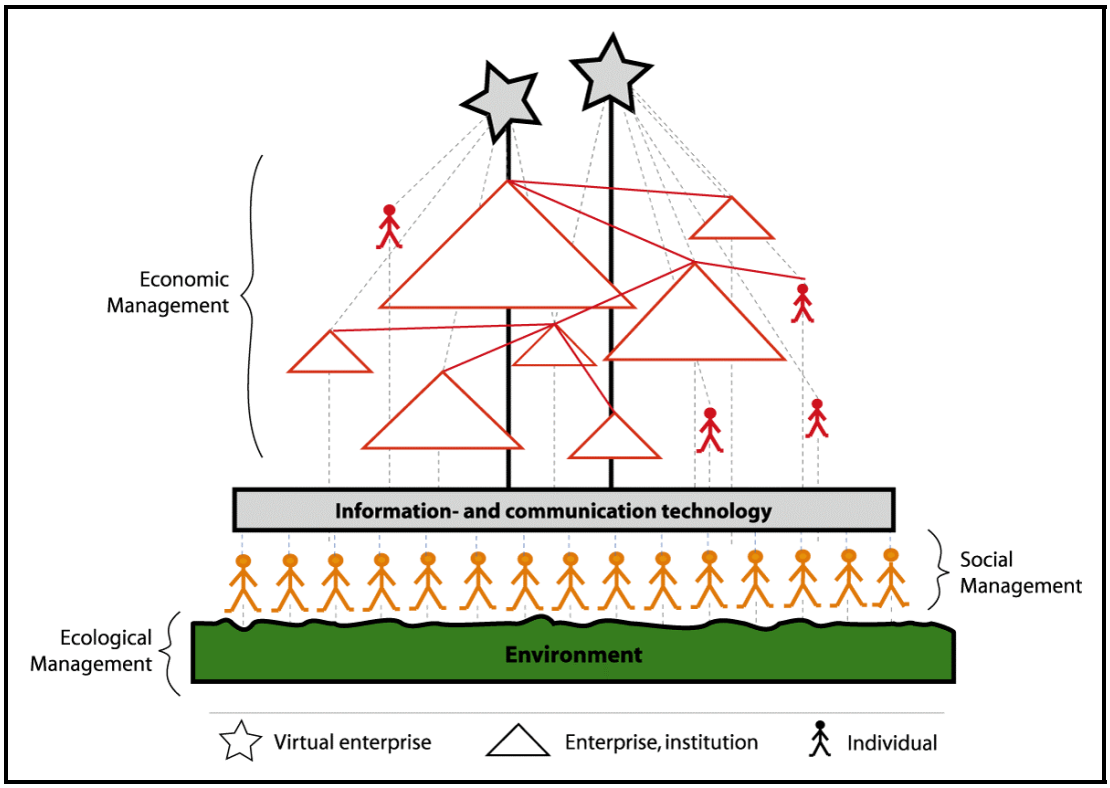


**Figure 18: Economic-social-ecological management in relation to virtual enterprises**

Finally, it can be said that the sustainable dimension of this diploma thesis is theoretically true: ***If sustainable management is the mission statement of virtual enterprises then sustainable development is being supported.***

# F. PRO EVOLUTION

## 1. The Environment

### 1.1. General

The meaning of the word *environment* is originally “that which surrounds”. Regarding mankind it means that our environment is the planet Earth, the *earth system*, including the food we eat, the water we drink and the air we breathe (cf. Munn/Mooney/Canadell, 2002). The planet Earth can be seen as a complex and mainly closed system (cf. Matthews, 2001). This view of one earth and one system became visually clear when the first pictures were made from space showing the planet Earth as one “small and blue” thing in space.

For the last million of years, the Earth system has been relatively stable, especially for the last 10.000 years. The environment has mainly remained in a condition that generally supported life. Considerable *global environmental changes* until today have been caused by natural forces and this has happened over millions of years (cf. Munn/MacCracken/Perry, 2002).

### 1.2. Environmental Change

Up to now, because at present, mankind has become a global force; a force which is ever-increasingly responsible for environmental changes. In the last decades the activities of mankind have become global and simultaneously the dimensions of the intervention have become significant (cf. ibid.).

Changes are becoming evident in critical areas of the environment – increasing carbon dioxide concentrations, rising sea level, collapses of fisheries, declining in biodiversity, holes in the ozone layer, tropical forest destruction, etc. According to predictions the environmental changes of the 21st century could be far greater than expected (cf. ibid.).

## 1.3. Result

To sum up, the *Earth system* has to cope with changes caused by mankind that may destroy the basis for human life. A concept to do something about it is called sustainability. It can be regarded as a positive economic-social-ecological interdependent solution.

# 2. Evolution

Evolution can be seen as the process of change in systems through selection of transmittable attitudes. Moreover, it can be regarded as structural changes through structural coupling, which is a learning system coupling between the systems (cf. Maturana/Valera, 1987). The systems cannot operate within each other but can manipulate each other on the basis of this structural coupling (cf. Wikipedia, 2005, http://www.wikipedia.org). Therefore the systems adapt to the changing circumstances of the other systems around.
As a result, it can be assumed that evolution, additionally to its biological meaning, also can take place within the main systems of the world. In this sense the evolution of the main systems is regarded as the change of their structure through a manipulation of the other systems around. Therefore, in this sense of evolution the economic-, social- and ecological systems adapt to the changing circumstances of the other systems around, enabled by structural coupling between them and thus evolution takes place.

However, due to the ecological problems that were described above, one can see that the structural coupling between the economic-, social- and ecological system is naturally not that strong. One can see for example that at present the economic system is not manipulated by the other systems around strong enough so that it adapts its structure to them. However it can be seen that its structure even damages the structure of the ecological system, which is, however, needed for the surviving of the other main systems. Therefore the structure of the economic system can be regarded as not sustainable in the long term (cf. ibid.).

## 3. Pro Evolution

One possibility to support a structural change in the main systems would be to improve the structural coupling between them so that they adapt to each other more quickly.

The idea regarding this thesis is now that the natural structural coupling could be supported by a man-made structural coupling on the basis of the information and communication technology. A structural change in the economic-, social- or ecological system which is then enabled by the information and communication technology is according to my theory called Pro Evolution.

## 4. Overall result: Pro Evolution – sustainable management in virtual enterprises

*Sustainable management in virtual enterprises* involves the economic-, social- and ecological system. Therefore one can assume that the created product or service has at best an economic-social-ecological *pattern*. This *pattern* changes the structure of the systems in one single aspect and delivers an inter-organizational result.

As a result the virtual enterprise has possibly changed the structure of the systems and supported the structural change between the systems. Due to the fact that the mission was enabled by the information and communication technology this process is pro evolutionary in the context of this thesis.

Finally each mission, each virtual enterprise that is done in a pro evolutionary way is changing the structures towards the vision of sustainability.

To sum up, the following figure illustrates the idea of Pro Evolution in relation to one virtual enterprise:

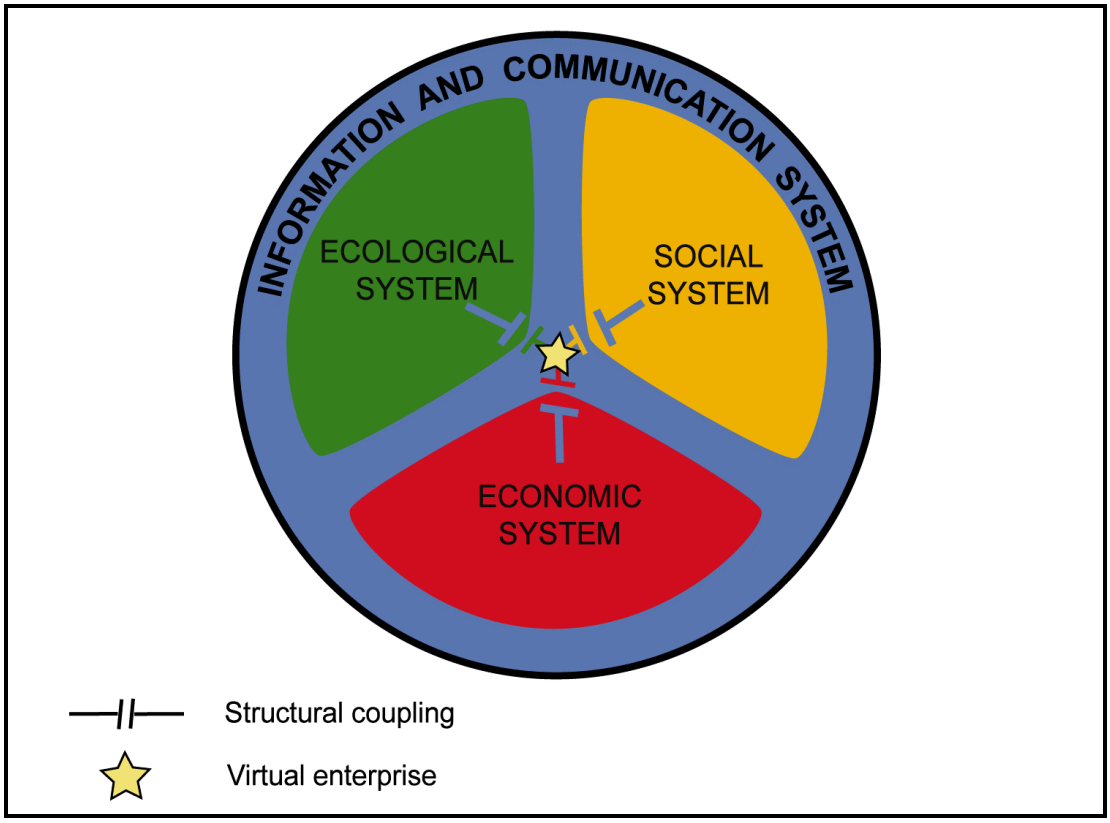


Figure 19: Pro Evolution - sustainable management in a virtual enterprise

Finally, it can be said that the evolutionary part of this diploma thesis is theoretically true: ***Sustainable management in virtual enterprises is Pro Evolution.***

In the future an “as if” dialogue with the ecological system will become increasingly important. Only this way the needs of this system can be included into a sustainable development (cf. Neunteufel, 1997).

# G. PILOT SCHEME MAKAvAVirtual

## 1. What is MAKAvA?

### 1.1. MAKAvA Enterprises

MAKAvA Enterprises is a small junior enterprise which was founded by Michael F.J. Wihan & Jan A. Karlsson. Based on their courses of study at the FH Joanneum the core competences are in the areas of Internettechnologies and management and industrial management.
The purpose of the company is to realize intelligent and sustainable products in the branch of the food industry.

### 1.2. MAKAvA Drink

The first product of the company will be an *elexir of life* on the basis of the yerba maté tea and it should become a model for an economic-social-ecological product. The first planning stage in which stakeholders from the ecological, social and ecological systems were included, resulted in the following decisions: the drink will be organic, the international ingredients from Argentina, China, South Africa and Mexico will be supplied by *fair trade*, a glass bottle will be used that can be reused up to 90 times and great parts of the logistics will be done by train.

### 1.3. Yerba Maté

For interested people MAKAvA Enterprises will also be a middleman for the South American yerba maté products. In this part of the company, sustainable management is the mission statement too. Therefore, for example, organic yerba maté tea will be supplied which is harvested in the jungle. The supplier also follows the mission statement of sustainable management and thus tries to buy as many areas in the jungle and plants maté there so that it cannot be cut down by other industrialists.

## 1.4. MAKAvA.at, MAKAvA.NET, MAKAvA.org

A great part of the company will be based on the Internet. Therefore a web-shop can be found at MAKAvA.at and an online comic which tries to create consciousness for sustainability can be found at MAKAvA.NET.
On MAKAvA.org MAKAvAVirtual can be found that is the name of the virtual organization of the company. To underline that a great focus of the company is laid on the realization of various products and services on the basis of virtual enterprises the whole company got the name MAKAvA Enterprises.

# 2. The virtual enterprises of MAKAvA Enterprises

## 2.1. Introduction

As the purpose of the company is to realize intelligent and sustainable products and services a lot of competences are needed that are not provided by the small enterprise itself. For the product “MAKAvA Drink” missing competences can be found in the fields of research and development, production, marketing and logistics. For the role of the middleman of the yerba maté products additional competences are needed that are not available internally either; furthermore they differ from those of the first product. Additionally, other stakeholders should be included to support the complex product development processes.

To cope with those needs a virtual organization was implemented out of which virtual enterprises are being created. At present (09.2005) the first virtual enterprises are in the initiation phase (see D.1.3. The life of the virtual enterprise). In the following chapters now the creation of the virtual organization is described.

## 2.2. Economic dimension

### 2.2.1. The partner network

To make it possible to create innovative and sustainable products and services on the basis of great competences, the product development processes are supported by different partners. Those partners mainly belong to a partner network. MAKAvA Enterprises can be regarded as the leader of this partner network (see D.2.3. Networks and D.1.5. The information broker).

The main questions that arise for the network (see D.2.4.2. Main questions regarding the partner network) are answered in the following list:

- Which information and communication systems should be implemented?
  → An Internet portal on the basis of the open source software Zope will be implemented.
- What are the rules of accepting a new partner for the partner network or releasing another?
  → A personal relationship between the partners is focused as a start. Partners that focus on sustainable management are welcomed to the partner network. A partner is released if he/she abuses the given trust.
- On which levels should the cooperation take place?
  → The cooperation might take place on every level.
- How can the existing processes of the single partners be modified to be able to cooperate more easily?
  → Due to the fact that the focus is based on know-how no processes are being modified.
- Is it possible to work without contracts?
  → A standard contract is given to those partners who get insights to the company's secrets.
- Who acquires the orders?
  → No orders are acquired but instead missions are initiated internally.

- Which organization or person leads the partner network?
  → The network is lead by the company MAKAvA Enterprises.
- How is the know-how stored which is produced in the virtual enterprises?
  → The know-how is stored in the content management system of the Internet portal MAKAvAVirtual.
- What common initiatives can be made to support the network (i.e. lobbying or common advertising campaigns)
  → Common activities like meetings and parties are planned from time to time. Furthermore, the partners are included into the marketing of MAKAvA Enterprises and lobbying activities are being supported.

### 2.2.2. The virtual enterprises

The partners are dynamically involved into projects and supported by an Internet portal. They work autonomously on their specific tasks and self-organization is being focused. Therefore the different projects of MAKAvA Enterprises are done in virtual enterprises.
MAKAvA Enterprises is the information broker of all virtual enterprises. It leads the virtual enterprises hierarchically and therefore MAKAvA Enterprises can be regarded as the leader (refer to D.1.5.The information broker).

## 2.3. Technical dimension

### 2.3.1. Technical network basis

As already indicated, the technical network basis for the virtual enterprises is the Internet. The decision for using the Internet as the basis was made because the costs for a private wide area network would be too high and, furthermore, an aim of the virtual organization is that as many participants as possible may contribute to the missions (see D.3.2. Technical network basis).

### 2.3.2. Technical software basis

The virtual organization and its virtual enterprises are based on open source software. The software product Zope was used as a basis on which additional modules where implemented, such as, for example, the content management system Plone.
As a result, most of the specific needs of virtual enterprises are made available (see D.3.5. Possible technical basis).

## 2.4. Social dimension

### 2.4.1. The role of the autonomous partner

#### 2.4.1.1. Creating the basis of trust

The mission statement of *sustainable management* is the binding mission statement of the autonomous partners in the partner network of the MAKAvA Enterprises. Therefore, the cooperation between the company and the autonomous partners is theoretically less risky regarding the needed trust (see D.4.3. The importance of trust).

#### 2.4.1.2. The working conditions

It has been shown that a lot of competences are needed from the autonomous partners who contribute to virtual enterprises (see D.4.2.3. The role of the autonomous partner).
In practice it quickly could be seen that the teleworking especially can be a critical factor. As a result, personal meetings with the autonomous partners will additionally be arranged where the Internet platform is introduced to them. Additionally, already at the start it could be suggested that not all of the work will be done completely *online*. Moreover, the information and communication technology should help to coordinate the work.

#### 2.4.1.3. Additional roles in MAKAvAVirtual

**Community:** Additionally, a community should be created where people of different opinions may participate in the virtual enterprises. Therefore, the user role “community” was created in MAKAvAVirtual. Each user with this role can now view all objects that are set to the security stage “community”. As a result, in addition to the professionals everyone to whom this role is given may participate to some extent.
At present the community is mainly a group of friends who, in addition to the idea of sustainability, are also motivated by the idea of “participating in a new form of cooperation” (see D.4.6.5.2. Motivation factors).

**Anonymous:** A visitor of the MAKAvAVirtual platform (MAKAvA.org) who does not log in (with an id and password) is given the chance to give comments to all objects of the virtual enterprises that are set to the security state “published”. Therefore the need of sustainable development towards including as many stakeholders as possible is granted (see E.2. Sustainable innovation networks).

**Member:** A visitor who registers himself/herself in MAKAvAVirtual gets the chance to be informed by the system about changes in the areas he is interested in. Those areas can be chosen by the member. Additionally a member may use his personal folder to present himself/herself to the other visitors or he may change data with other visitors.

#### 2.4.1.4. Self-organization of MAKAvAVirtual

Self-organization is focused on two levels: On the one hand, the professionals should work on the different missions autonomously and should organize themselves to a great extent. On the other hand the community should include a self-organizing dynamic into MAKAvAVirtual regarding events, meetings or parties to strengthen the personal relationships. Finally, the members or anonymous visitors should give inputs in the form of comments in general.

### 2.4.2. The role of the information broker

Looking at the new circumstances regarding the management, all possible strategies are used that were introduced to make a productive work possible (see D.4.2.4. The role of the information broker). Those are presented and related to MAKAvA Enterprises in the following list:

- **Management by objectives**: Management by objectives will be used to coordinate the tasks of the partners. Therefore, the system of the chairman of Cypress Semiconductor T. J. Rodgers will be used that looks as follows: Each user has a list of aims like “meeting with marketing because of production planning” or “contacting customer X”. After each aim the system shows when it was agreed by the partners, when it should be finished and if it is already finished.Thus there need not be a bureaucracy to check whether somebody is physically working or not. When a discrepancy between aims and done work of a partner arises one can intervene. With this system T. J. Rogers looks after the aims of 1500 employees and it is said that it works (cf. Davidow/Malone, 1997).

- **The manager as the coach**: A good personal relationship between the partners will be focused where coaching the autonomous partners is attempted.
  Additionally, a professional coach and mediator is one of the partners of the network who will support the single partners on a personal level.

- **Bonus system**: Two bonus systems will be implemented in MAKAvAVirtual:
  The first one gives the partners rewards when they do their tasks very well. Those rewards will be presents such as products of the company or in the future also journeys etc. should be given. Also a community member is able to get presents.
  The second bonus system will be based on the solved tasks, ideas or

innovations the partner brings in. For each solved task, good idea or innovation, virtual money or other forms of points are added to one's virtual identity. Sustainable innovations are most valuable in this context (see D.2.6. Creativity and innovations). The virtual money can afterwards be exchanged for real money or presents in relation to the profit of MAKAvA Enterprises. This reward system will look like an online game.

- **The meaning beyond work**: The mission statement of *sustainable management* is the meaning beyond the work of MAKAvA Enterprises. This meaning should be communicated to all of the participants.
  MAKAvA Enterprises binds itself to one rule: Profit that is made out of sustainable management is reinvested in sustainable management again.

## The MAKAvAVirtual Internet portal

The virtual enterprises of MAKAvAVirtual can be found in an Internet portal that is based on the possible technical example introduced in the economic dimension of this thesis (see D.3.5. Possible technical basis).

In the portal all users are finally enabled by this information and communication technology to share information and communicate. A very powerful identity management can be regarded as the starting point and a project management system finally becomes the basis for the virtual enterprise missions.

The following figure is a screenshot of the Internet portal MAKAvAVirtual:

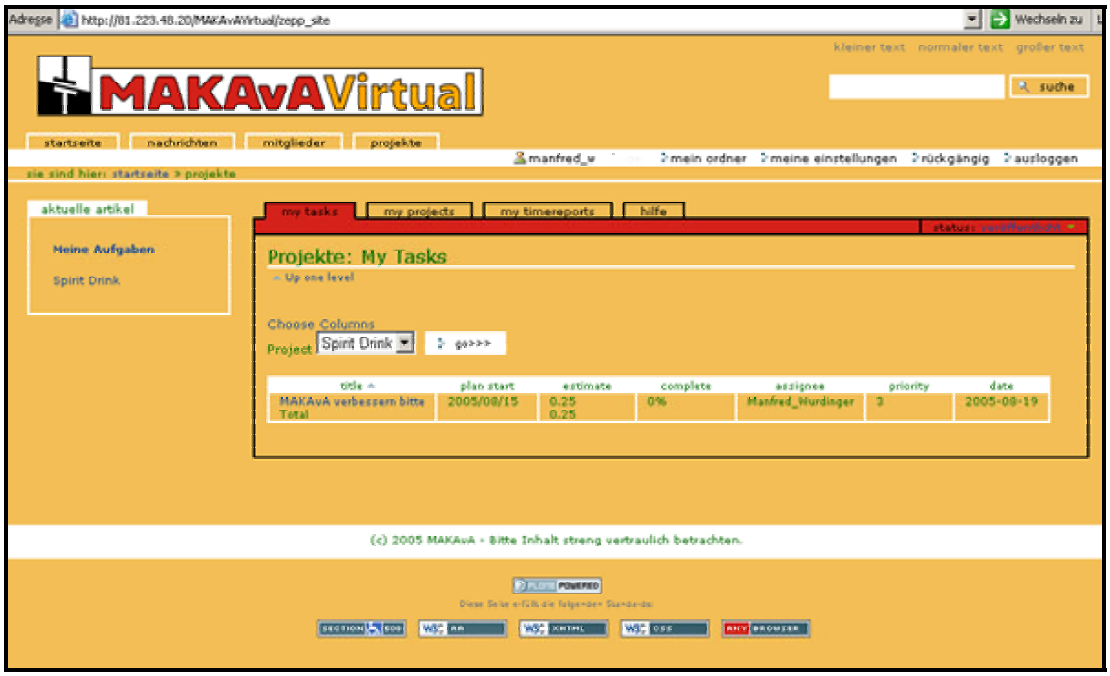


**Figure 20: MAKAvAVirtual screenshot from MAKAvA.org**

Additionally one software orientated virtual enterprise is founded by MAKAvA Enterprises which aims to create a ready to use virtual enterprise software on the open source basis of Zope/Plone. Therefore, the system that is used for MAKAvAVirtual will be made available for other small and medium sized enterprises so that they become able to implement the technical basis for virtual enterprises quickly and for relatively low costs. Additionally, attempts will be made to motivate the open source community to create new modules that explicitly focus on the idea of sustainability.

### 2.4.3. Pro evolution - sustainable management in the virtual enterprises

As already mentioned the purpose of MAKAvA Enterprises is to realize intelligent and sustainable products in the branch of the food industry. Therefore, the mission of each virtual enterprise that is founded in MAKAvAVirtual has an economic-social-ecological aim, the partners are sought along economic-social-ecological lines and the operative phase is

done by referring to the vision of sustainability (see E.3. Sustainable management
in virtual enterprises). Therefore sustainable management is practised in all virtual enterprises of MAKAvA Enterprises.

Finally, due to the fact that each virtual enterprise creates a product or service that was planned by people representing the systems of sustainability, the produced products and/or services have sustainable *patterns*. As a result, with each product and/or service one small part of the structure of the planet Earth has been changed with the help of a technical dimension. This is now pro evolutionary for the planet Earth – in the context of this thesis.

# 3. Overall result

The company MAKAvA Enerprises which was founded by the author of this thesis tries to realize sustainable products, services and innovations with the help of virtual enterprises and a community that supports the missions due to the shared vision of sustainability.
Finally, the created pilot scheme called MAKAvAVirtual should show in the future whether the diploma thesis can also be applied in practice or not. It should give insights to strengths, weaknesses, possibilities or threats that may arise in practice.

# 4. Vision

The vision is that the “MAKAvA Drink” becomes a great success because of the various competences that were included and, therefore, it should become a model for *sustainable management in virtual enterprises*.
As a result, other (small and medium sized) enterprises should also imitate this concept and start to work in a pro-evolutionary manner. Finally, a great virtual organization could arise that may include various enterprises,

institutions and individuals that realize sustainable projects or services in virtual enterprises together. Non-profit organizations or artists may also support the community by means of advertisement because of the shared mission statement of *sustainable management*. Additionally, supply chains may be created between the partners (not discussed in this work, see C.3.4. Virtual organization versus virtual enterprise).

This virtual organization is likely to grow on the basis of open source software and the Internet. As a result, those who want to support a sustainable development could relatively easy participate in *sustainable management* for the vision of sustainability. The following figure should illustrate this vision:

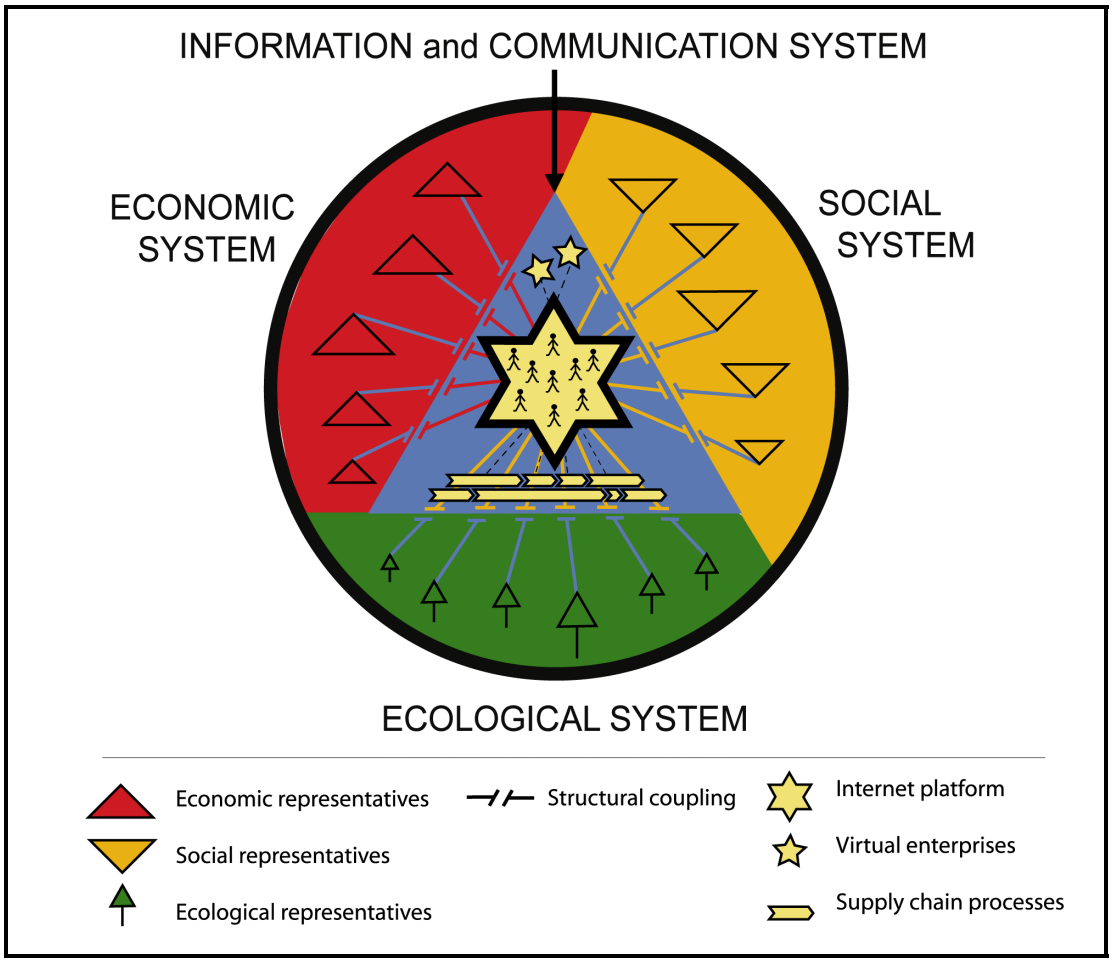


**Figure 21: Sustainable management in a virtual organization**

Finally, I want to add that everyone is welcome to join **MAKAvA.org**.

# H. TABLE OF FIGURES

# I. LIST OF REFERENCES

## 1. Books

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