

ZSOLT TÓTH

**INNOVATIVE PROCESSES GENERATED BY THE
GREEN SPIDER NETWORK,
IN THE LIGHT OF COMPLEXITY THEORY**

CASE STUDY

University of Western Hungary
Sopron, 2005.

INDEX

INTRODUCTION.....	3
COMPLEXITY AND INNOVATION.....	4
NETWORKING AND NEW ECONOMY	6
HISTORY AND GENERAL OBJECTIVES OF THE GREEN SPIDER NETWOR.....	8
INNOVATIVE INFORMATION SERVICES OF THE GREEN SPIDER	11
INDUSTRIAL INNOVATIONS OF GRP PLASTICORR	14
GREEN NETWORKS AND INNOVATIVE FORMS OF EDUCATION	18
NETWORKING PROCESS AND PROFESSIONAL TRAINING	21
SUMMARY.....	26
BIBLIOGRAPHY.....	27
ATTACHMENT.....	28

INTRODUCTION

Complexity theory is basically a multidisciplinary approach which, by analysing the dynamic processes, models the emergence and the operation of the complex structures and networks aims at a better comprehension of the complicated interrelation between participants.

Due to its interdisciplinary character and to the adjustment to the rapidly changing economic and social phenomena, according to the concept of modernity, complexity is not a homogeneous theory but determines the new directions of scientific thinking. For this reason it is more appropriate to treat the theory as a new scientific school and, when analysing the complex systems, to follow a less rigid methodology than that of the traditional scientific schools. The scientific investigation carried out in the spirit of complexity theory can be valid only if the basic milestones of complexity are very well precised in the given field.

The most important principles of complexity theory remain essentially the same in the analyses made in biology, informatics, psychology, social psychology and sociology.

- It is often emphasized that selforganization is a characteristic feature of complex systems. If such a system is left alone in an initial phase, spontaneous internal organizational processes begin to work resulting in the formation of structures not having existed before and not characteristic of its parts.
- An important aspect of complex systems is that, in general, a network can be attached to them. In the very complicated situation when numerous, specifically interacting parts are present in the system, the most simple approach is the graph theory description. Instead of describing the complete dynamics, as a first approach the interrelation network will be mapped. Moreover, it has been revealed that the topology of this static network or graph includes non-trivial, innovative features relating to the big family of practical systems.
- In the complexity theory a notion emerges that is not precisely described but often mentioned in this context: existence on the merge of chaos. Some think that there is such a kind of behaviour, characteristic of the complex systems. In fact, there is a special state of the system, between the state of complete order and the total chaos (in other cases it is said that it prefers being in this state).

Complexity theory is basically used in different economic analyses, for describing and explaining the innovational processes of economic organizations in the phase of networking. In the light of complexity, the description of innovation is essentially based on the new interpretation of individual decision making process and of the mental structure of the individual. However, all the outlined elements of complexity theory are extremely important.

COMPLEXITY AND INNOVATION

To establish of the theoretical examination of complexity of the decision making process is Herbert Simon was the first. According to him, complex systems emerge by an accidental formation of their single components. However, the accidental nature of „nothing ventured“ is directed by the selection itself. The role of selection is highlighted by him by the example of the human problem-resolving by man. Similarly to the Twenty Questions game, the questions and answers show the right way to the solution, the emergence of solide transitional forms indicate the right direction of evolution. Every step, correct or wrong, provides information for the next one [Simon, 1962.]. It is rather interesting that at this point, Simon’s reasoning coincides with the idea of Eigen, related to the prebiotic development of the macromolecules [Eigen, 1971.]. In systems distant from the equipoise, in case of the realization of given conditions, some molecules with „template“ characteristics can develop. The multiplication of these molecules is ensured by self-reproduction. One of the main points of the conditions is the possibility of selection between the interim forms. Both authors point out, independently one from the other, that it is not the appearance of the „free energy“ but that of several interim forms that ensures the possibility of selection and the rapid passing of the process. Eigen says that in this aspect „information arises from, or gains value by selection“. The continuous constraint of decision-making flexibility, the necessity of nonstop learning and the ability for adaptation induce that organizations in the process of networking and continuous re-structuring, including also the networking economic organizations – if we ignore the the historical determination and the factors of power often resulting in a controversial effect – can be more successful than others with traditional and hierarchical structure. Naturally, also in certain substructures of the hierarchical organizations we can find the advantages deriving from the flexibility owing to the networking process, to the „free“ selforganization and to the appearance of the interim forms.

However, the theoretical study of the human decision-making complexity necessitates also the examination of the psychological structures, existing behind the human decisions made during the innovational process. The agents of the small „worlds“ of networks and structures act in a different way or do not act at all in the course of the innovational process. The driving force behind the action and the victory over the uncertain outside factors can be understood on the basis of the notions „ontological commitment“ and „ontological uncertainty“ introduced by David Lane [Lane, 2003.]. According to Lane, due to the strict connection between the social action, the human needs and the values, the agents of the innovational process and their products and artefacts constitute a common „space“ and it is in this common „space“ that superposed, self-generating and innovational processes are to be examined. An entity existing in a given medium or substance, acts according to the model ideated on the substance. Basically, this model can be conceptualized as an ontological obligation. The mutual actions happen in a definite order. However, the rapidly changing substance necessitates the continuous renewal of the ontological obligation, otherwise the ontology which is independent from the changes, can lead to drawing incorrect conclusions (fallacy of a time-independent ontology). The challenges coming from the rapid changes are accompanied with a lot of uncertainty (ontological uncertainty). Theoretically, the solution of the problems which are well structured from the point of view of decision theory (truth uncertainty), should not cause any problem, yet the majority of the uncertainties are of semantic character. Even the semantic problems – a part of them – can be modelled by the decision making process based on the fuzzy sets. Another part of the semantic problems, e.g. the ambiguity which is essential in the innovational processes and also the lack of common system of notions, however, cannot be modelled by methods based on the decision theory. The lack of capability of being modelled is explained by the fact that in the given space – real or psychological – new entities appear which can be considered as new challenges, persons or products as well and, naturally, the former rules and outputs are not valid any more. However, surprisingly good decisions can be made even under such circumstances, particularly because the narrative determining our actions, our former actions and the dynamic memory map constituted by the determining characters of the actions is capable to be renewed, under the effect of the new features and the challenges. In fact, the new characters and actions enrich the narrative we have inside and the new arriving elements, e.g. people, products or services – due to the interrelation between the action and the narrative – result in a new intention for action, having a decisive importance in the innovational process. In fact, this is the innovative advantage of the networking process. The

networking organizations, having a multitude of relations and developing in a dynamic way, bring much more entities and actions into the psychical space of the agents and the enriched narrative can lead to innovative initiatives and actions and provides relevant answers to the challenges of the world. This is less valid in a bureaucratic organization.

On the basis of the above, it is obvious that from the point of view of sociology and first of all in the economic respect, the central element in complexity theory is networking and it can be related to the science of networks (nexus) [Buchanan, 2003.].

NETWORKING AND NEW ECONOMY

The networks, as subjects of scientific examination, became important parallelly with the exploding changes of the 1990ies. From the 90ies, the demolition of the barriers in front of the capital, induced an incredible capital expansion, new social and economic phenomena and problems, too. The presumably historical defeat of the „socialist“ regimes, emerging as opposite poles of the capital-dominated western world, made possible the development of the global capitalist economy. At the same time, the common basis of the manifestations and changes characterizing our age, is the exploding expansion of the information technology. Without this, the process described nowadays as globalization, would be impossible. Within the above process there are two major flows: from the one hand there is the spread of learning in the economy, from the other there is networking. These processes have resulted in the transformation of companies into educational organizations where the flow of knowledge becomes dominating over the material flows. This means also the revaluation of the innovation process. In the sphere of production, a process of virtualization and dematerialization is moving on, implying the reappréciation of human relationships and the need for communication.

The phenomena of the networking economy, built upon the modern, infocommunicational technology conduced to the birth of the scientific paradigm of the „new economy“ which is far from being uniform. According to the enthusiasts of the „new economy“, by way of the expansion of the new information technologies, a better and cheaper access to data, easy handling, processing and storing of the information is available. Due to the above fact the former structure of the economic activities will be basically modified and, the capitalist world – becoming more flexible and losing partly its capitalist character – will be able to handle the economic recessions and regressions which are codified in the production method. Earlier, these recessions were efficiently handled by the system of public interventions but

nowadays it is impossible to treat them on the nation-state level. The critics of the theory state that due to the collapse of the dotcom firms and the recession of the technological shares, the expectations are not completely fulfilled and a lot of people think that the validity of the „new economy“ concept is only partial.

It is true that the capitalist enterprises take advantage of the new technology and, making more effective the exploitation, they escape „staight on“ from the inner contradictions of the capitalist mode of production. However, they set themselves against the manifestations which tend to shock or transform the foundations of the capitalism.

The critics' favourite example is the violent and unscrupulous opposition against freewares. In fact - from the capitalist point of view - these programs which are free, open source coded and mostly free of charge, cannot be considered as products. While the new copies and downloads bring new value for the user, these operations do not imply any further cost, use of resources, or any profit increase. For this reason the counter-interested parties bend every effort to ensure the patent rights and, in the meantime they do their hardest to discredit the freewares. Even in the case of non-free softwares, only by using severe administrative measures is it possible to ensure the product's commercial character - see the example of the well-known software police in Hungary. In a more general form, if the information or the information product itself becomes a determining element in the economy, it can serve the existing capitalist dominance only in the event that the product-like character of them is somehow ensured. In the opposite case both the economy and the society is expected to undergo a transformation.

Naturally it would not be worth making a vision of some kind of a new, non-capitalism based socialist (?) society, since the actual situation is rather plastic and only a relatively small slice of the social and economic manifestations could be resolved by the disappearance of the product-like nature. However, the case study character of the present analysis does not serve this purpose.

In my opinion the above theoretical introduction leads undoubtedly to the following preconcept: if we wish to examine the correlation between complexity and innovation on the level of the networking organizations and we are looking for the source of innovation on the level of interdisciplinary forms, organizations and networks, the nonprofit and non-capitalist organizations can serve as primary field of scientific examination. The capitalist

companies and the hierarchical public organizations mean an important innovative force, but the reasons of it – if we do not talk about networking – must be looked for inside the scientific researches financed by the state or supported by powerful capital.

The role of the money spent on the research is of primary importance, the nonprofit organizations can face exactly the problem of money as limit to the innovation. We must also take into consideration the fact that the theory of complexity is well founded in every case when examining an innovation process, due to the general character of the particular phenomenon of consciousness. Of course we must not forget that networking – which, in my opinion is of crucial importance - appears also by the private companies and public organizations but, in general, hierarchy remains always very important and the self-organizing networking process does not become dominant on all levels of the organizations.

On the basis of the above considerations, I have chosen the Hungarian Green Spider Network as subject of my study. The Green Spider Network gathers different organizations, committed to the environmental protection. The main part of these organizations work on a nonprofit basis, the smaller part of them function as coordinators of the small enterprises, established by an innovation entity overstepping even the boundaries of the network's self-organizing structure. The innovative substance, besides the innovation of product and service, seems to be the most spectacular in the field of the educational innovations, passing beyond the methods of the traditional educational systems and the related environment protection training courses. I think that, in the case of the Green Spider Network (in Hungarian: Zöld Pók Hálózat) it is worth examining not only the story of a single innovation case – because the different innovations are strictly connected to each other – the real sense of this study lies in the revelation of the interconnection between the different cases of innovation. From the point of view of complexity, the pulsating and complex innovation processes can be more interesting than the isolated cases of innovation.

HISTORY AND GENERAL OBJECTIVES OF THE GREEN SPIDER NETWORK

Since the beginning, the objective of the Green Spider Network has always been the same - naturally adapting it to the changing external circumstances: Help maintaining the relationship among the national social organizations and among other, national and international participants of the social organizations and the given topic (environmental

protection, peace, human rights etc.). Within the above objective there are several points as follows:

- Developing the method of information handling within the social organizations,
- Contributing to the rapid and effective flow of information among the national social organizations,
- Creating an international telecommunication contact for the civil organizations,
- Building an information bridge between the social organizations and the environment protection authorities, research and educational institutions,
- Improving the relationship and communication among the agents working in the social field,
- Supporting the information and consultation service for young people.

We can see that the general objectives of the Green Spider Network concentrate on the introduction of new infocommunicational technologies and on the motivation of networking. The Green Spider Network was established on the initiative of the Universal Existence Environmental Protection Association, the Energy Club and the Göncöl Foundation. The Green Spider Network began working in March 1993, the task of maintenance and development of the network was assigned to the Green Spider Foundation set up in January 1994. In the beginning, they used a specially developed communication software for achieving the above goals. At that time this software was pretty advanced, it was able to send and receive e-mail messages, read news and handle divided file spaces. At the moment the Green Spider server did not have any on-line Internet connection. Of course, the Internet boom of the 90ies left its marks also on the Green Spider technology. Both the external and the internal conditions have changed. The dialling method service was abandoned because the ever growing number of competing Internet servers could provide a better quality at a slightly higher price. This trend resulted in an inner staff reduction, in the transformation of the Advisory Board and in the need of creating an innovative service system.

Consequently, in the end of the 90ies it was unavoidable to make the necessary steps and changes in order to realize the objectives and the further development of the Green Spider Network. However, the full time staff number surveying the network infrastructure was hardly reduced, from 6 to 5 employees. The knowledge and skills coming from the different member organizations and the work of the volunteers joining the network activity was

enough to manage the transformation and to find the new directions. With the exception of the dialling service, all the other Green Spider service remained in operation, also in the transitional period. The e-mail service, the mailing lists, the file space, the news groups and the websites kept working.

The establishers of the network expected a number of users of 30 for the first year and, for long terms they counted on some 80-100 users. Compared to this, by the end of the first year they reached the number of 80 and the new enterings - with a slight fluctuation - is progressing at the same rate as in the beginning. Today the Green Spider has got 300 direct users and developers who are in connection with more than 50 organizations and, through these organizations they coordinate the daily activity of several ten thousands of alternative thinking people, reaching hundreds of thousands through the Internet. Three-quarters of the users are environmentalist organizations, the others are representatives of the peace-movement, the women's rights movement and other civil organizations. Without the infrastructure, the dynamic virtual communication and information space provided by the Green Spider, the creation of the external relations and the establishment of the selforganizing and innovative partial network would be impossible.

Consequently, the Green Spider Network is becoming more and more important tool for the social movements. It is an updated source of information (competitions, events, professional information) and a public forum for debating several issues, for creating common positions and forms of co-operation. Besides, the Green Spider is an important tie for several „hidden“ provincial organizations, connecting them to the national movement, from the Szigetköz to the Viharsarok, from the Órség to the Zemplén (different regions in Hungary - the translator).

Green Spider is open for every social organization, private person, authority, educational and research institution, which have regular news for the movement or waiting for information from the movement. The innovative character of the organization can be examined in different levels and aspects, its innovative force is worth of attention, considering the level of undercapitalization of the member organizations.

INNOVATIVE INFORMATION SERVICES OF THE GREEN SPIDER

The information infrastructural services offered by the Green Spider Network are accessible at a modest price. These services are exclusively open source coded and mainly free of charge, contributing to the shaping up and development of new type products, services and activities.

The organizations participating in the network pay just for the storage handling, but the participants and other agents of the different sub-networks, beholding the success of the softwares, are contributing themselves to the propagation, naturalization and development of the free softwares in Hungary with financial supports, software testing service, formulating new suggestions and by direct improvement of the open source coded softwares.

Maybe it is not a mere chance that a part of the adopted open source coded systems, generally not developed in Hungary, are used by the network members in a large proportion, even in respect to the total number of users. With regard to the theory of complexity, the open softwares and the space used by their developers and users are enlarged with new agents and complex relations by the networking procedure. This trend is leading to the appearance of regular initiatives of innovation, from the psychological, social and economic points of view as well. The co-ordination of the different development phases are made by the Green Spider Tea House - existing both virtually and physically - , operated by the network. It is not a pure chance that the network plays an active role also in the fight against the extremely severe software patents - some companies wish to take out a patent even for „double clicking” . In this phenomenon we can recognize the postmodern „counter movements” being organized on the net.

Green Spider is the Hungarian member organization of the Association for Progressive Communications-nek (APC), which is the worldwide federation of the social movement networks, from Argentina to Russia, from Alaska to New Zealand. Among the APC conferences on social rights, human rights, women’s rights, on the peace movement and on the environment protection, on educational issues etc., every organization can find a topic which can be an important source of information. The APC networks give mutual assistance for the Internet access of their users, when they are abroad. In the past years, the international cooperation has been a crucial element of the high level professional services provided by the Green Spider Network.

There are wide-ranging information services offered by the network for the national users. One part of the services is used basically by the members of the network and, through the common flow of knowledge, the communication and information space, it is exerting an innovative influence as described above. Services of the Green Spider Network:

- High technology store services (SSI, PHP, MySQL, PostgreSQL, other CGI running, various statistical analyses), mailing server and post box including antivirus protection and spam filters,
- Dynamic, advertisement free public or private mailing lists, promoting team communication,
- Graphical services, editing, editorship of flyers, posters and other publications, designing of logos and design of corporate image, other graphical works at nonprofit prices which is extremely important for the small and underfounded organizations,
- Analogue and digital video registrations, registration, cutting, processing and labelling of the movement's video films,
- Website design service, preparation of websites containing interactive elements (forums, comments, news refilling, gallery of pictures, on-line petition and voting etc.), programming of individual web adaptations.

In some cases, however, the information service itself can be considered as a product of the innovation process, generated by the network. From the beginning of its existence, the Green Spider Network has always pointed out the importance of preparing substantial and spectacular web adaptations with the less possible work and without burdening the co-workers of the network.

The homepage preparation program: *APC Action Apps*, developed by APC (Association for Progressive Communications) especially for the civil organizations, created a good basis for the elaboration of a suitable homepage designing surface. The network succeeded in upgrading the APC Action Apps system and rendering it into Hungarian. This action was possible due to the fact that from 2001 an ever growing number of the network's managing colleagues and the voluntary programmers of the member organizations could be involved in the APC co-development programme. This is the way the Green Spider Propaganda on-line homepage constructing system is created. It enables all the member organizations to make publications and communications on the web, even without any professional skill.

There is no need to understand the HTML, the FTP, the website construction, because the contents can easily be modified, by filling in simple forms the given modifications instantly appear on the homepage. The outward form of the different homepages can be handled independently from the contents, in this way the news, the calendars of events, the link collections and the archives are easy to be edited. The flow of knowledge on the net is particularly increased by the fact that the news exchange among different organizations and homepages is very simple to be resolved, the different information can easily and dynamically be restructured on other pages and following other aspects.

By the way in the APC development network only a few traces of hierarchy are left, so the evolvement of the different homepage editing software clones is – from every point of view – the result of networking which is, also from the aspect of the theory of complexity, very interesting.

The services offered by the Green Spider News can already be used by several organizations which, in other ways, could not have any chance to make regular and high level web communication. Among the special News adaptations we can find an information portal on treatment of waste, a database on open-air schools and pages on the alternative movements. Among the different adaptations, an extremely important one is the Indymedia Hungary Independent Media Center, a member of the international Indymedia network. For some years, the center has been providing a pack of services – the volume of which can be compared to that of the most important Hungarian information portals like Origo and Index – on the basis of the Green Spider News on-line news editing program and with the help of the voluntary editors and authors. Another respectable portal is that of the Association of the Hungarian Environmentalists, which has created a high level information and communication portal, both from the point of view of contents and appearance. The Association, using the services of the Green Spider Network, established an independent and complex network together with distant member associations which often face serious financial problems. In their 2004 National Meeting, the members pointed out that the infocommunicational space ensuring an intensive co-operation among ninethousand members could not have been established without the service of the News and without the Green Spider Network. It seems quite natural that an organization which build upon such an efficient and intensive information exchange, would - sooner or later - mean a very strong potential. (We should not forget that the association is just one of the co-operating members of the Green Spider Network.) It is to be emphasized that only by this member

association there are 14 different environmental protection innovative programs running. The innovations of the Green Spider Network's co-operating organizations and those of the supporting firms which are generated – partly or totally - by the co-operation, are deriving from the character of the network, belonging to the „top hits” of the environmental protection topics and their number is pretty high. These innovations cover the following fields: energetics, power generation, treatment of waste, food industry, industrial pollution prevention, education and other services. Among the hardly calculable number of environmental protection innovations which have been generated by the organization, in the respect of the theory of complexity, the industrial and environmental innovations are particularly important. It is not especially from the intensive co-operation with the „green” company sphere that these innovations were born; one characteristic case will be described in details in the following chapter.

INDUSTRIAL INNOVATIONS OF GRP PLASTICORR

From September 2000, the Hungarian Association of Environmental Protection – already mentioned in the previous chapter as the biggest member association of the Green Spider Network -, in co-operation with the Hungarian Energy Club (member association as well) and with the Hungarian Center of Cleaner Production, has developed a program the aim of which is the establishment of a professional dialogue between the entrepreneurial sphere and the civil (mainly green) associations.

Two concrete fields were chosen as subject of the program: „Promotion of the dialogue and the co-operation between the entrepreneurial sphere and the non-governmental organizations” or shortly „Company Sphere and Green Organizations” . In these fields the transparency and the communication among different enterprises together with the participation in the decisions related to the environmental protection is extremely important or shall become of cardinal importance in the nearest future. One of the most important fields is the IPPC Directive of the EU (Integrated Pollution Prevention and Control) which prescribes a completely new environmental protection permit procedure for 30 different sectors, allowing the public participation in the permit procedure. The other field is the subject-matter of the environmental reports of the different enterprises, which is under expansion also in Hungary and offers an opportunity for the two-way communication among the participants living in the sphere of action of the given enterprise. Besides the above mentioned facts the program is aimed at introducing some tools of the environmental

management used in the business practice which – more or less – are quite new in Hungary but could be useful for the judgement formed on the environmental activity of the different enterprises.

The program was developed in a way that both the civil (first of all green) organizations and the enterprises could make a benefit from. During the program numerous documents were published and distributed among environmentalist and nature preserving organizations, other non-governmental organizations working in the related fields of activity, enterprises, economic associations and some consultancy firms. Moreover, training courses were organized, offering the opportunity for the representatives of the above mentioned groups to meet, to make personal consultations on the above tools and to exchange their points of views and experiences etc.

In the program some 300 environmental organizations and 350 enterprises participated. The great number of professional articles and study volumes published as a result of an intensive flow of information based on the co-operation, together with the progress of knowledge, represents a huge innovative force, but also on the level of the national economy, the program has contributed to spectacular technical and technological innovations. Among these innovations there are the excellent products of GRP Plasticorr Ltd., which were awarded several prizes.

GRP Plasticorr Ltd. was established in 1991, by two Hungarian engineers, Vilmos Kajtár and József Maros. Both of them have a decade-long experience gained in a research institute, in the domain of the development and application technology of fibre optics synthetic resin composit systems. Before, the two experts worked in the Plastics Industry Research Institute. After the change of the political regime, the Hungarian plastic industry passed through a serious crisis. Thus, the institute was rationalized and transformed.

Of course, in the first years, which were characterized by a serious shortage of capital, surviving of the business would have been impossible without the professional experience and knowledge accumulated during the several years of research work. Vilmos Kajtár, founder of GRP Plasticorr Ltd., patented already in the Plastics Industry Research Institute numerous procedures – e.g. corrosion prevention of containers, coating procedures – which were remarkable also from the point of view of environmental protection. However, the privatized Hungarian plastics industrial companies were not susceptible to innovations. In

this anti-innovational environment GRP Plasticorr Ltd., right from the beginning, has put in high relief the applied research activity. In order to resolve the technical problems of the different industrial needs, they developed individual technologies, offering suitable solutions in every respect and for all the requirements of the age. During the long years of their research activity, the establishers of GRP Plasticorr Ltd. have recognized that the production and the use of plastics can cause serious damages to the environment. This fact lays a heavy moral responsibility upon the plastics industry and, sooner or later, the ever stricter environmental regulations will require them to effectuate a renewal concentrated on the environmental protection. Unfortunately, during the last 15 years, the state policy, serving the industrial lobby, has not justified their expectations. However, based on their technological skills and - from the mid 90ies - on the ever more intensive co-operation with the environmentalists, the company has become well-known all over the country as producer of environment-friendly, innovative and cost saving products. Besides the intellectual progress, the co-operation brought good reputation to the firm which was really useful for them from the point of view of marketing as well. Also the global problem of the exhaustion of resources played an important role in the determination of the directions of development. Due to the relations the company had in the field of the environmental protection, GRP Plasticorr Ltd. realized well before the competitors that the price increase of the raw materials indispensable for the production of plastics, first of all the rise of the petroleum's price, gives preference to the production of plastic industrial products which are durable and demand the utilization of less raw material. In the life of the enterprise, the co-operation with the member associations of the Hungarian Association of Environmental Protection and with the „green” enterprises, in the frame of the program:” Entrepreneurial Sphere and Green Organizations”, proved to be extremely fruitful. It is a thought-provoking fact that following the program, from 2001-2002, the company management was complemented with technical experts who had worked before in the environmental protection sphere. These experts continue regularly publicating their professional experience gained in the course of their plastics industrial development activity. Obviously, it would be exaggerated to attribute the industrial innovation of GRP Plasticorr to the networking process but it is quite sure that if we accept the formerly described main elements of complexity theory, networking must be considered as of primary importance in the way to innovation. Based on its procedure, patented under the brand of PLASTIMOL®, starting from the simple corrosion-proof coatings the firm offers complete solutions to the renovation and transformation of industrial tanks and pipelines. Among others, the recent technical solutions include the following fields: improvement of tanks (single or double layer, jacketed

etc.) with different coating materials with or without reinforcing substances; renewal of large diametered pipelines under pressure; doubling of the tanks' shell and transformation of them according to the standards; development and production of double shelled tanks and complementary fittings. As a result of their own R&D work, they worked out a revolutionary process for the production of the complete roofing of vertical tanks. This process is used with success in the case of the 500 m³ and 1000 m³ capacity tanks. GRP Plasticorr introduced some particularly sensitive testing methods in the field of tank technology. In the frame of the R&D program aimed at the rehabilitation of high-pressure gas pipes, the company developed a repairing method - which has turned out to be competitive on the European level as well. Using this method, the pipes can be repaired without any breakdown and the solidity characteristics of the repaired pipes are much better than those of the original, unrepaired steel pipes.

Naturally, the technical parameters of the innovations are of secondary importance but it is a fact that the GRP Plasticorr products are cheaper and more environment-friendly than those of the competitors.

The philosophy of the company - described in their short article „GRP Plasticorr - against the stream - seems to be justified: „Our company's vocation is creating the harmony between the industrial and the natural environment. For several years, we have been seeking for the solution in order to resolve the contradiction between the world created by God and the world operated by human beings. This is very often a fight against the stream, since the real benefit of our environmental protective methods - even if they are of a relatively rapid rate of return in comparison with the traditional methods - will be enjoyed by our children and grandchildren.

The industrial application of our procedures based exclusively on the results of our own R&D activity was also a fight against the stream - following from the traditionally conservative attitude of the national industry. Today we arrived at the point that the national industry pays particular attention to our a PLASTIMOL® brand named composit coating systems and structural materials and these products are regularly used for coating and doubling the shell of the tanks.”[GRP Plasticorr, 2005.]

The company has been awarded several prizes in the field of environmental protection and innovation. In 2003 GRP Plasticorr Ltd. won the „House of the Hungarian Quality Prize”

and the same year, won the Innovation Prize 2002 given by the Ministry of Environment, for the successful industrial application of the procedure: „PLASTIMOL® D, the Reliable Soil and Water Protection”. This latter award was taken over in the Parliament by Vilmos Kajtár, from the hands of Ferenc Mádl, President of the Republic of Hungary. Also in 2004, in a moral appreciation of its activity, the company won the golden medal 2004 of the: „Industry in the Service of Environment” and „Industrial Technology Development Foundation”. The prize was handed over by Zoltán Gyapay, Member of Parliament, member of the Environmental Committee of the Hungarian Parliament.

The company, without the co-operation within the environmental network already beyond the limits of the Green Spider Network, would be far from achieving such a success. It is a good example for demonstrating that by the networking process, even the companies joining from outside to the great variety of alternative and environmentalist movements, sharing partly their innovative and radical spirit, can gain a considerable advantage in the competition, in the „space of innovation” generated by the new actors, agents and products of the spiritual and organizational space.

GREEN NETWORKS AND INNOVATIVE FORMS OF EDUCATION

From the 1990ies, on the basis of the progressive traditions of the 70ies and 80ies, the Hungarian secondary and university education is offering an ever growing ground to the environment-conscious thinking and to the education of environmental protection. This can mean an indirect innovative force in the public education, but the experts all agree that within the system of public education the environmental protection courses must concentrate particularly on the environment-conscious thinking and, in order to achieve this objective, high level of teacher training programs must be granted. Resolving the complex problems of environmental protection is mainly the task of the environment engineers. Consequently, the role of the university education in the environmental training and in other innovations is of crucial importance.

In the frame of the gradual training program - besides the professional training of teachers - today also the environmental engineer training program is getting an important place in the Hungarian university education, both in the frame of the special disciplines of technical and of agrarian training. Several special postgradual faculties and training programs are being accredited. Together with the above mentioned forms of training, there is a possibility of

obtaining an environmental economist – environmental manager degree in a postgradual form. The environmental training program is already present in the teacher training faculties of different universities and colleges.

The organized and rather hierarchical training structure, following the „academic“ character of the Hungarian university education can be considered as really high-standard, from the professional point of view. However, the often rigid training forms cannot comply with the requirements of the different environmentalist movements and experts, because neither the forms of training nor the transmitted professional attitude are innovative enough. All the above, from the point of view of complexity, is a perfectly logical consequence: in the university environmental training program the regularly appearing and transforming actors do not mean any challenge, furthermore the rigid structure and attitude and the lack of networking are becoming undoubtedly the barriers of the innovative information flow. There are serious gaps in the environmental training program.

The different green organizations, building upon the multilevel knowledge existing inside the member organizations of the green and alternative networks – in strict co-operation and developing together with the Green Spider Network – and upon the intensive information flow rendered possible by the networking process, are capable to fill in the gaps which are present in the structure of the university education. First of all, it is the National Federation of Environmental and Nature Protection Training Centers (KOKOSZ) that coordinates the organization of the training program, furthermore helps the elaboration of the suitable professional competences and the co-ordination of the experts' work and supports the search for the missing elements of information. All the above would be unimaginable without the infrastructure of the Green Spider Network. From the point of view of complexity it is particularly important that – recognizing the novelty and the professional quality of the different innovative training programs high level education institutions have joined the training programs after a few years time. It is also worth thinking about the fact that numerous environmental training organizations which did not benefit from the opportunity of the innovative space being within the different types of co-operation, simply vanished in the past years' period.

Examining the different environmental training programs, having worked with a great number of students for several years, we can find several elements of innovation, in comparison with the traditional university training programs. In general, it is about special

innovative training programs both in respect of contents and methodology in the fields which formerly considered by the great universities as of secondary importance.

The aim of the so called „Herb Garden in the Kindergarten and at School“ accredited teacher training program organized by the Eco-Forum Foundation, is to create an up-to-date attitude to health. The basic objective of this program is the realization of an ecological thinking and attitude built upon a wide-range environmental knowledge, through some practice obtained in herb gardening. According to the experiences, due to this training program which - seemingly - is not very important from the point of view of modern economics, the graduated teachers reached great professional success. Several studies were made to describe that following the Eco Forum Foundation's methodology which has regularly been updated, very serious success has been reached in the education of the socially disadvantaged pupils and deviant children, furthermore the institutions could realize an important additional income deriving from the cultivation of herbs, made in a playful way. The accredited training program called „Environmental Education in the Forest“ which was organized in co-operation with the Eco Forum Foundation and the National Association of Forestry, exercised the same effect as the above described case and, due to its professional values, the program obtained a financial and professional support from the University of Western Hungary and from the Ministry of Environment Protection and Water Management. It is to be attributed to the success of the teachers and environmental experts who participated in the above program, that in 2004 the number of applicants was so high and consequently the income of the Foundation increased to such a great extent that a further - free of charge -training program was introduced for the teachers living in the underdeveloped settlements. The same results have been obtained by other training programs and postgradual training courses, realized in co-operation with the member organizations of KOKOSZ. All these courses were based upon innovative subject-matters of instruction and new methodology. Each one of the programs: „Local Compost-Making in Educational Institutes“, „Free of charge Education of Basic Knowledge and Map-reading Skills“, „Organization and Realization of the Open-Air School Program“ etc. is apparently of small importance but summing them up, they surely represent a considerable innovation in the field of education.

A part of the training programs is destined for the technical intellectuals. The Independent Ecological Center is organizing free of charge seminars and courses under the title „Metrovillage or Metropolis?“, on the topics of sustainable architecture and urban

development. As a matter of fact, the program is a „stop-gap” if we consider that before its introduction there was no clear subject of instruction neither any methodology. Under the title of „KÖRPÁLYA – Environmental Consciousness and Preparation of Competition Documents” the Foundation for the Technical Development of the Industry educates the subject: EU Experience on Environmental Protection and Environmental Consciousness. All the types of the above training forms are impossible to enumerate, the interest for them keeps getting stronger. At the same time, in spite of its high but not up-to-date professional level, we can be witness to the agony of a training program organized by the N.L. Central European Nations Academy in co-operation with one of the Hungarian agrarian universities. In fact, this program cannot mobilize even the intellectuals of the given settlement, although energetics is one of the most exciting fields of the environmental industry.

NETWORKING PROCESS AND PROFESSIONAL TRAINING

Actually, the professional training is an open but unpopular educational form in Hungary. While in the partly paying universities and in the other higher grades of education the number of students show a growing tendency, in the basic instruction system some 40 thousand students graduate every year and the places endowed by the state remain regularly vacant. In fact, on the average, the graduated career-starters’ wage is the double or twice and a half as much as that of the young graduates of the professional training institutes, who – in general – continue their studies. According to the Ministry, the problem can be solved by the two-level maturity examination system, facilitating this way the admission to the universities. In my opinion, due to the rather low prestige, this cannot be the real solution, however, the lack of practical professionals causes serious distortions in the economy of Hungary. For several years, the labour market in Hungary has been suffering the lack of skilled workers. This trend results in the fact that the main part of the yearly offered 50-60 thousand vacant places are filled up with guest-workers coming from abroad, mainly from Slovakia, Romania and Ukraine. First of all, the solution is to be found on the social level, but the experiences gained from the networking process – in our case from the success of the Green Spider Network – can be useful in healing the troubles.

Taking into consideration the Hungarian population’s even more intensive process of ageing and the past years’ spectacular growth in the number of accessible places in the universities, it is not likely that the traditional, general skilled workers’ training structure will be able to

compete with the university education. In fact, from the sociological point of view, the longer periods of studying and the improvement of the general culture is a heartening tendency. The question is whether – in parallel – it is possible to gain relevant practical skills as well.

At the moment, in Hungary there are at least five different types of training systems. The level of the traditional skilled worker training structure – according to international studies – is one of the worst at the European scale. The situation of the technical schools, giving also a G.C.E. or a high school diploma, and of the technician training courses is somewhat better. However, the level of the professional training system, which is available after the school leaving examination, is very poor. The university level professional training courses, integrated into the university education system are often considered as stepchildren of the structure.

In the field of the professional training, the need of adaptation to the labour market and to the technological and technical development is even more accentuated than in the other fields of training. However, the accreditation process of the professional trainers is too long, even in the most favourable conditions, it takes a year. Consequently, a quick reaction to the changes of the labour market becomes impossible. The training itself is often based on 5-10 years old subject-matters of education which, in some disciplines, leads to a catastrophic lag. Another significant obstacle to the renaissance of the educational system is the rigid and hierarchical regulation and attitude which is still ruling the professional training system. In the past years, in order to ease the problems, involvement of the private economy to the professional training has been attempted, with variable success. In general, the educational institutes –accustomed to the rigid structures – are in lack of the necessary competences, they are afraid of changing the „time-honoured method“. „There is no common code, register and sphere of concepts which could facilitate the exchange of knowledge.“ [Bessenyei, 2000.]

If we take a look at the school partners of the Green Spider Network’s member organizations or those of the parallel networks, we can hardly find any professional training institutions. The formerly presented KOKOSZ (National Association of Environmental and Nature Protection Training Centers), one of the Green Spider’s most important member organizations, is a network gathering 83 schools out of which only one is a professional training institute. Similar proportions can be found by the other environmental training

associations as well. This is particularly strange because among the secondary schools there are several institutions specialized in a professional environmental line. In the academic year of 2004-2005, more than forty secondary schools were dealing with the training of technicians. On the basis of the needs of the green economy and that of the environmental industry, several other institutions could join the work of the environmental networks, since from the machine industry to the food industry, there is a need for specialized experts. In the meantime we can feel that the national professional training institutions remained stuck in the old structures and educational schemes, it is difficult to require from them any selforganization, networking or establishment of innovative spaces.

Taking into account the problems, we can say that the lack of preconditions for networking is an obstacle to the creation of an innovative and progressive agent and to the establishment of the intensive knowledge flow which is necessary for moving forward. Without changing the rigid structures, neither any professional renewal nor the formation of any innovative space is possible. Every development plan, which does not result in the growth of the participants' „degree of freedom“, can be only a partial step forward. There are a lot of possibilities for the creation of an innovative space, of dynamizing the system of relations. Among these opportunities I would like to cast light upon the case of a secondary school, dealing with the education of silviculture, wood industry and environmental knowledge. The way chosen by this school follows the strict co-operation among the existing secondary schools and universities, leading to an expansion of the intellectual horizon of the institutions and to upgrading their professional level. This way requires relatively modest resources and involves small risk. The co-operation among the technical schools, universities and colleges, completed with an advanced degree professional training program, integrated in the university education, can „push“ the training institutions to the process of networking, with the aid of the universities having a richer and less hierarchical system of relations.

From 1885, under changing names, the Roth Gyula Practising Technical School and College of the University of Western Hungary, is one of Hungary's most advanced training schools. In September 1990, the school - specialized primarily in the education of silviculture and wood industry - was transferred under the authority of Sopron town of county rank, from the control of the Győr-Sopron County council. The expectations attached to the change of authority were not at all justified. By the mid 90ies the former professional level of the school was rushed into danger, because in 1996 - due to some cost-saving measures - only two classes were allowed to start, the former number of students was cut down by 50%,

while the number of applicants – due to the good reputation of the school – remain very high. The school, by way of another change of supremacy, could survive and renew.

A great number of the Roth Gyula Technical School graduates continue their studies in the University of Western Hungary and in the legal predecessor, the University of Sylviculture and Wood Industry. Thus, the personal contacts have always been very strong. In September 1992, the institution became the practising school of the newly established Teacher Training Institute within the University of Sylviculture and Wood Industry. The school was given the task of the professional formation of engineer-teachers. In 1999 the school went under the authority of the University of Sopron, as a practising school. After this change the school took a new lease of life. The school, complying with the new training programs of the university, started the professional training of technicians in the following disciplines: Beast Economy and Environmental and Water Management. From 2001, in spite of the dramatic fall of the number of children, the number of classes was raised to three, according to the high number of applicants. The school adopted the „four + two years” program. In 2004, also an ECDL examination center was established inside the school. The corresponding education system was renewed, the school undertakes also the special OKJ training after two years from the final examination.

The technical school, through its intensive university contacts, was able to enlarge its educational portfolio and to raise its professional level. The institution, besides the educational innovations, takes advantage also from the innovations applicable in the other sectors of the national economy and, today to a small but ever increasing extent, takes part also in the innovation processes. It results from the special line of the institution that through the university, also the intensive knowledge flow within the Green Spider Network plays a role in the formation of the innovative atmosphere.

The educational and scientific co-operation among the member organizations of the University of Western Hungary and the Green Spider Network is pretty wide-ranging. Among the common projects – from the point of view of innovation – the most remarkable one is the project and serial of forums „Produceable Energy”, supported by the Energy Club, full member of the Green Spider Network. The project is aimed at the coordination of the various national researches on the energetical use of the biomass, of the soft stem and ligneous plants. The other objective of the project is to make civil and company propaganda, with more and more spectacular results. The researches carried on in the Faculty of

Energetics of the Institute of Environmental Technology and in the Faculty of Forestry Engineering within the University of Western Hungary can be considered as one of the most important segments of the very interesting field, both in respect of science and economy. The researches, supported by several practical examples, prove that planting „energy woods” would reduce the country’s dependence on foreign energy, which actually is very serious from the point of view of foreign trade. This would be a solution for mid terms, effectuated in an environment-friendly way. The elaboration of the technology regarding the plantation, cultivation and cutting of the energy woods would have been impossible without the site experiments made in the 534 hectare study forest of the Roth Gyula Practising Technical School and College of the University of Western Hungary. The practical part of these experiments was mainly tried by the students of the technical school. The professional experiences coming from the special character of forestry and lumbering - together with other research and co-operation activities - contributed to the fact that in 2003, the nursery-garden production line won the Innovation Grand Prize. This device, adapted to the special features of the ground and to the given cultivation branch, was developed by the Faculty of Machinery of the Institute for Forestry-Engineering and Environmental Technology working within the Faculty of Forestry of the University of Western Hungary. The production line ensures the mechanization of a special field of the forestry, where - up to now - there was no home developed and produced machinery. The production and the sale of the production line ensures a long term job for the employees of the Bagodi Mezőgép Ltd.

The production line and parts of the line are successfully operated by several dozens of enterprises and private entrepreneurs. The development is particularly important because from the change of the political regime in Hungary, the number of innovations in the field of the machine industry has dramatically declined.

The above mentioned example demonstrates the fact that in the following years, the co-operation between the different technical schools and universities, the information flow among the partner institutions and the participation in the selforganizing networks can be one of the main resources of the new structure of professional training.

SUMMARY

The innovative processes generated by the Green Spider Network have rather a great variety. In the present study - after having clarified in the theoretical introduction what I meant under the notion: theory of complexity - I examined in the light of this theory the various innovations having very different characters. However, all these innovations are inseparable from the innovation space which is built upon the network. Of course, when choosing the different innovations or making some vague but unsaid groups of them, due to the character of the analysis, I was obliged to follow an arbitrary approach.

In my opinion, the nucleus of the multi-colored theory of complexity can be best examined on the basis of the contrast between the networking and the hierarchy-creating process. Thus, during the analysis, the examination of the network as an independent and pulsating entity can be even more interesting than that of the innovation processes of the given enterprises which is a very exciting course of proceedings in itself. Naturally, the most complete analysis could be the examination of the common space of innovation of the networking organizations. For this reason, I tried to achieve partly this goal by my study. Respecting the limits of size and the form of the present study, I had to describe the different innovation stories in a shortened form. I could emphasize to the necessary extent the role of the information space which is generated by the networking process only in this way.

BIBLIOGRAPHY

1. Website of Indymedia Independent Media Centre: <http://www.indymedia.hu/>
2. Website of the Association of Hungarian Environmentalists: <http://www.mtvsh.hu/>
3. Website of Green Spider Network. <http://www.zpok.hu/>
4. Bessenyei, István (2000): For the margin of the professional training project: Integration of job and learning. The knowledge management networks in the integrity of job and learning. Budapest.
5. Buchanan, Mark (2003): Nexus, Small Worlds and the Groundbreaking. 2002 by Mark Buchanan.
6. Eigen, Manfred (1971): Selforganization of Matter and the Evolution of Biological Macromolecules. Naturwissenschaften. 58. 466-521.
7. GRP Plasticorr - against the stream: <http://www.grp-plasticorr.hu/index.html>
8. Kocsis, Éva - Szabó, Katalin (2000): The Postmodern Enterprise. Ministry of Education, Budapest.
9. Lane, David (2003): Seminar Notes On 'Redirection'. <http://www.psych.lse.ac.uk/complexity/PDFfiles/Seminars/DavidLaneMay03.pdf.pdf>
10. Simon, Herbert A. (1962): The Architecture of Complexity. Proceedings of the American Philosophical Society. 106. 467-482.

ATTACHMENT

Full right members and partners and associates of the Green Spider Network, in Hungary and in the neighbouring countries, on February 1st 2005:

- Foundation for the Otters
- Alba Circle
- Scrub Forest Foundation
- Hikers' Association in Borsod-Abaúj-Zemplén County
- Central and East European Working Group for the Enhancement of Biodiversity (CEEWEB)
- ECOLINST - Institute of Ecology for the Sustainable Development Foundation
- Universal Existence Environmentalist Association (ETK)
- EMLA Environment Management and Legal Association
- Energy Club
- Environmental Culture Association of Esztergom (EKOKU)
- Upper Tisza Foundation
- Midway Foundation
- Gaia Foundation
- Gaja Environmentalist Union
- Gyűrűfű Atelier
- Holocene Environmentalist Union
- Humanist Movement
- Indymedia Hungary
- Round Hill Association
- National Association of Cyclists (KEROSZ)
- National Association of Environmental and Nature Protection Training Centers (KOKOSZ)
- 'The World Could Be Different' Network
- „Air” Working Party
- Hungarian Environment Economics Center (MAKK)
- Hungarian Traffic Club (MKK)
- Hungarian Association of Ornithology and Environment Protection (MME)
- Association of Hungarian Environmentalists (MTVSZ)
- Mental Disabilities Advocacy Centre (MDAC)
- MME Group of Komárom-Esztergom County
- MTA ÖBKI Project for Natural Flora Inheritance of Hungary 2002-2005
- Nádasdy Foundation
- National Biodiversity Platform
- Nimfea Environmentalist Association
- No Logo
- Ornithologist Circle of Pest Suburban (PKMK)
- Regional Center of Energy and Material Saving (REAK)
- The Conscious Buyer - Beyond Consumption
- Waldorf Kindergarden and School of Vác
- Society for Protection
- Green Youth
- Econnect - Czech Republic
- Eperinda - Romania
- ChangeNet - Slovakia

- MOST - Poland
- ZaMirNet - Croatia
- GLUK (GlasNet) - Ukraine
- BlueLink - Bulgaria.