FUTURES STUDIES

IN THE INTERACTIVE SOCIETY

FUTURES STUDIES DEPARTMENT

CORVINUS UNIVERSITY OF BUDAPEST

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2009

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EDITED BY ÉVA HIDEG

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Introduction

This book consists of papers which were prepared within the framework of the research project (No. T 048539) entitled *Futures Studies in the Interactive Society* (project leader: *Éva Hideg*) and funded by the *Hungarian Scientific Research Fund* (OTKA) between 2005 and 2009. Some discuss the theoretical and methodological questions of futures studies and foresight; others present new approaches to or procedures of certain questions which are very important and topical from the perspective of forecast and foresight practice. Each study was conducted in pursuit of improvement in futures fields.

Interconnectedness and interactivity are the guidelines of studies. Interactivity shows the characteristics of the dynamic relations and interconnections of the world and also the importance of the human factor's new role in interactivity. Living in interactivity we have to be aware of how to act in certain situations, and how we can become creative as components of different complex systems. The ability to create foreseeing knowledge and its continuous creation are elementary of interactive human existence. Therefore, *interactivity is of great importance from the aspect of the further development of futures fields as well*. Each study deals with certain concerns of interactivity challenge that is sensible in futures fields and seeks to respond to them theoretically, methodologically or through development of futures procedures and methods.

Éva Hideg's first study *deals with the future of future studies in an environment of instability and strengthening interactivity*. Her starting point is that the present of futures fields is determined by competition between two lines of futures studies, evolutionary and critical futures studies. The end of the competition between the two trends is still uncertain, however, the idea of integral futures has just emerged in the futures literature. *She shows the possibility and interpretation of integral futures*

embedded in the evolving process of the futures field, and as a paradigmatic answer to new social challenges, to sustainability, democratic participation and continuous knowledge creation. The three new challenges are interconnected by interactivity. Futures studies should also respond to challenges with the development of its own activity and paradigms. She defines integral futures and its new paradigms by way of reconstructing the history of futures paradigm and a dynamic and comparative analysis of paradigms. In one respect, *integral futures is the cooperation of theoretical and practical futures studies,* that is gaining independence, but at the same time interlinked by many threads. In another, *it is the complementary development of co-evolutionary and participatory paradigms and competition within the paradigms* that leads to the evolvement of sustainability, participation and continuous knowledge integration, in response to social demand for production of new knowledge.

Providing a framework of today's globalisation, *Endre Kiss* proves that globalisation is a new system of power and dominance with new interdependences. In this new global order actors' freedom to shape the future has increased significantly, while their actions serve only their own short-sighted interest. At the same time, global future shaping competence also lacks its actorial foundation. Neither traditional forecast, nor traditional consensus-making, traditional decision-making, nor any other traditional institutions are capable of improving global future shaping competence. On the other hand, global indebtedness narrows future alternatives significantly. He claims that *today's globalisation creates new circumstances for shaping the future and cultivating futures studies as well.* Futures studies can help to improve the global competence of actors through participative future shaping procedures, during which increased actorial freedom is connected to actorial responsibility and the interest of humanity.

András Vág provides a general overview of the effectiveness of environmental policymaking, and, through it, the new needs of policy practice in scientific research and futures fields. He emphasizes that the *application of models of environment and society interactivity makes possible to get new knowledge for policymaking and its assessment and to explore possible future scenarios.* If planning comes to the fore, then the traditional role of futures research and studies can reinforce the foundation of planning, especially in setting long term goals. Foresight procedure associated with models of interactivity and future scenario alternatives could help stakeholders to shape

and accept environmental policy. *Stakeholders' participation and acceptance could also improve the effectiveness of environmental policymaking.*

Péter Alács developed a comprehensive definition of foresight that can involve both notions of foresight, namely foresight as practice and foresight as a discipline within futures studies. He interprets foresight as an intellectual activity because it has no definite output or measurement of efficiency, objective or testable statement. Rather, *foresight is the product of methods and know-how*. For methodological construction of foresight he applies the communication theory and the tree-level approach to theoretical progress in science. In the foresight of micro-level stakeholders use subjective and creative methods to shape their own individual desirable future. In the foresight of meso-level the key factors of future are explored and selected by getting consensus among stakeholders. Scientific methods – microsimulation, dynamic modelling, etc – can enter foresight on this level through modelling futures studies. In the foresight of factors of macro-level importance for stakeholders' targeting are set to help stakeholders to personify the message of foresight by using networking and communication channels. *The three levels of foresight are interconnected and interact with each other if the system of methods has a theoretical foundation associated with each level, and transparency and involvement are provided for all stakeholders.*

In her study *Helga Veigl* places the weak signals research into the topics of futures studies. Her starting point is that individuals perceive signs and attribute a meaning to them in different ways depending on their cognitive structure and mental attitude. Weak signals research is becoming an important issue in futures studies because of the early sensing and different interpretation of signs. *If different meanings of signs are attributed to emerging processes that may occur in the future, then weak signals can be seen as alternative future constructions that can also influence other people' thoughts about the future*. Therefore, the construction of the meaning of weak signals can be a new part of subjective futures methods. She shows an example of how the process of meaning of weak signals can be integrated into the process of scenario building.

Éva Hideg's second study *focuses on establishing closer connections between technology foresight and participatory democracy*. She argues that the meaning of foresight and developed foresight procedures, including the meaning and procedures of

technology foresight, provides a suitable platform for advancing anticipatory democracy. An analysis of studies concerning the presence and forms of anticipatory democracy in different foresight activities/procedures, has led to the conclusion that the participation of stakeholders and citizens in foresight activities conform basically to different ideas of democracy. It was revealed that currently *the practice of technology foresight serves the idea of representative democracy better than the idea of participatory democracy. Applying the participatory methodology of futures studies and open innovation to the area of technology foresight should open the way to achieving participatory democracy in this field*.

Erzsébet Nováky and *Éva Hideg*'s study gathers methodological experience that can be deducted from the educational, regional and macro-level social foresight practice based critical futures studies and developed in Hungary. Methodological considerations, methods and combinations of methods were discussed through case studies developed by the authors. Using participatory tools developed in critical futures studies in order to involve stakeholders, including non-professionals as well, and integrate their future expectations into the future shaping process is a very effective procedure. *They emphasise that the freedom of speech and the free expression of opinion are the focal point of the whole foresight procedure.* Laymen are mature enough to articulate their opinions and their future expectations, while futurists can open the process and involve them in helping to develop future alternatives. They recommend that these experiences should be applied in the area of technology foresight in order that its social effectiveness can be improved.

Éva Hideg, Erzsébet Nováky and *András Vág*'s study presents a new procedure for shaping a future image in unstable environmental and social circumstances and by using an information technology background. The procedure is constructed in such a way that it can be refreshed lately. The subject of a future image is seen as an emerging complex social system whose future cannot be forecasted, however, the fields of its change can be explored, the signals and early forms of social changes and possible consequences of their cross-impacts can be meant and constructed. The developed two-way – objective and subjective – approach interrelated with each other and its almost real-time application is showed by shaping future image of Hungary in 2010. *This case study*

demonstrates the use of a web-based tool and the integration of hard and soft foresighting methods.

Gábor Neszveda and Fang Xin's study considers plausible solutions to situations like the so-called General Game by simulation. In the General Game many competing actors play a game in which each actor wants to earn the largest benefit that they can. One player's success depends on the number of players, and the strategies they give one-by-one; they do not have any previous information on the behaviour of other actors. *Neszveda and Xin created a procedure to find fairly good strategies by combining cooperative and competitive strategies. This procedure is named the General Simulator*. They tested the General Simulator by using their generated strategies in a real-life game with the participation of 200 students. They proved that *the deliberate use of the mixed logic of cooperative and competitive strategy creation can be very useful in practice under uncertain circumstances.*

Tamás Kristóf's study contributes to the discussion of methodological problems of corporate survival and solvency prediction. Within the framework of this study the most frequently applied bankruptcy prediction methods are competed on a Hungarian corporate database. Model reliability is evaluated by ROC curve analysis. The study seeks to answer the question whether the simultaneous application of data reduction and univariate splitting (or just one of them) improves model performance, and identify the methods to which it is worth applying such transformations. He has concluded that *univariate splitting adds more value to model improvement than data reduction in the field of bankruptcy prediction. The simultaneous application of data reduction and univariate splitting can be recommended mostly for neural network practitioners*.

The editor and all the authors hope that this book provides an excellent insight into the topical development issues of futures studies and foresight. Answers shaping in certain studies inform the reader about new approaches to the future, the interconnections and interactions of futures research, futures studies and the foresight, and about the renewing practice orientation of futures fields. Draft versions of some answers were also presented and discussed in meetings of COST Action 22 – Advancing Foresight Methodologies: Exploring new ways to explore, European Cooperation in Science and Technology sponsored by European Science Foundation from 2004 until 2007 – so, to

some extent, the studies reflect the European dimensions of changing futures concepts and practice.

Finally, I express my thanks to all collaborators, fellow researchers, students, the publisher's readers and proof-readers for their work and cooperation contributed to completion of the research project and this book. I thank the Hungarian Scientific Research Fund (OTKA) in particular for the grant given to this research project.

Éva Hideg
Editor and project leader

Éva Hideg

Interactivity and the Development of Futures Studies

The research issue and its approach

The present state of futures fields is determined by the competition between two lines of futures studies, evolutionary and critical futures studies. This competition could be considered favourable as it stimulates the evolution of approach and methodology to answer always-upcoming problems about the future. The competition is unfavourable as representatives of the two trends experience communication problems tending to eliminate each other, professional communication is filled with misunderstandings, those futurists that force one side do not learn from the other side, and they are not interested in producing theoretical consequences from empirical futurist work. *The end of competition of the two trends is yet uncertain; however the idea of integral futures has just appeared in the futures literature.* Slaughter declared in 2004 that present circumstance and way of cultivating futures despite its variation is 'not a good place' – anti-utopia – that should be left behind (*Slaughter*, 2004). By the beginning of the 21st century the futurists' work has become fragmented, which is why it is unable to contribute efficiently to the solving of the civilisational crisis. The Futurists' community should not be busy finding answers to questions such as: which future concept or methodology or method is correct or incorrect, they should however find answers to those that intend to lead the way for cultivating futures fields, and in a way that all futurists and schools of futures may contribute to the enrichment of the knowledge base and tools of futures fields. This new approach was called integral futures by Slaughter.

There are two main ideas regarding integral futures. In the first one integral futures studies is the improvement of critical futures studies when different future concepts and imaginations are connected at the transcendent level with transcendental meditation (*Slaughter*, 2008). The second idea of integral futures is based on the free will of the

futurist: all futurists can freely select their research goal, perspective and methods, which also include paradigms, grasping paradigms, as it is now usual in the fields of the social sciences (*Voros*, 2008).

This study shows the possibility and interpretation of integral futures embedded in the evolving process of futures field, and as a paradigmatic answer to new social challenges. This is fundamentally due to the fact that futures fields have a 40 year past. In the past 40 years there have been successful and difficult times as well. Futures have become a scientific field, having developed its paradigms, and the widening of its practice, were the main points of success; while the main difficulties were found in the ideological discussion as it developed into a science, and loss of confidence in the forecasts during the 1980s. *Futures has been able to improve itself while reacting to problems*; hence the experience of its development process could have been used for shaping the possibility space of its future, and showing the subject matter of integral futures from this aspect.

Futures has become an individual discipline and science in the 1970s and 1980s as a basic and an applied science at the same time, in addition to the practical need in society in relation to gaining further knowledge and influencing the formation of the future, these tendencies, both played a definitive role in this process. The change in societal needs has also played a significant role in the evolving process as futures fields are very sensitively connected to practice itself. Futures fields' responses to social needs also depend on the ability of the entire science and the futures fields as such, meaning a knowledge base, scientific approach and methodology could all be used for dealing with the future. *This study examines the future evolution of futures fields within this dual binding*. It searches for answers to the following questions: how the clash of trends could end reflecting new social needs; whether a new change of paradigm could actually occur; whether integral futures could come into existence; and which paradigms in relation to futures fields could be restructured. In seeking answers the study first goes through the past evolution of futures fields from the point of changing social needs, secondly it examines those social challenges that require answers from futures fields, and thirdly it searches for the responding possibilities of futures fields with the dynamic and comparative meta-analysis of the paradigms of futures fields.

The development of futures fields with regard to changing social needs up until today

Futures as futures research developed into an individual and normal science in the 1970s and 1980s. Reacting to the most instinctive human need it promised to foresee the future on a scientific basis with the forecast of probable futures. It supposed that governance supports or influences the shaping of the future within the forecasted range of future.

Prognostics had a definitive role in futures fields becoming a science. Prognostics was successfully cultivated in connection with or as a part of specialised disciplines from as early on as the 1920s. Prognostics as a scientific predecessor of the later individualising futures fields became its part as an approach and methodology. Futures fields carried on its prognostics's focus on the later forthcoming future, with its the emphasis of the genetic connection of the past, the present and the future, and its forecasting methodology[1].

The upcoming of futures research did not begin with the development of its own paradigm, but with forecasting and the creating of futures images, where futurists parallelly dealt with theoretical and methodological questions, adaptations and the development of methods, at the same time as focusing on the solutions of new assignments. The forecasting of economics and especially the scientific-technical development developed within the concept of *whoever 'knows the future', will indeed progress faster*. The future and the importance of progress are elemental parts of Western culture, however the two world order's living side by side, and their competition raised the significance of both areas. Moreover they were not just culturally important, but also at the level of daily political, social, economic and governmental decisions.

Ideological discussions and confrontations followed this golden age when forecasts and future images emerged. Futures as futures research which was developing into a scientific field, was at first rendered more difficult by its approach as an ideological issue in the ideologically divided world, as in the East, and as in the West. Futures research was considered as the shaper of the official ideology (e.g.: *Kahn* and *Wiener*,

and the activity of the Hudson Institute (*Kahn, Wiener*, 1967)) or as major left side critics (as reading reflections to 'Limits to Growth' by *Meadows* and his fellows (*Meadows et al.*, 1972)), while the futurological elements of futures research was labelled as a bourgeois science in the socialist world at that time.

Furthermore the first soviet futurist who was most acknowledged at that time, *Bestushev-Lada* wrote about bourgeois futurology, while his book entitled 'Window into the Future' incited activity in relation to Marxist futurology and social prognostics in the Eastern block (*Bestushev-Lada*, 1970). The era of détente brought peaceful coexistence and competition, in which ideological discussions and confrontations were moderated, as *the main focus was on working on daily problems and on the acceleration of social-economic development*.

At the same time this rejection incited those who were dealing with futures research to develop this new scientific discipline the *more free of value judgements as they could in addition to the search of new connections within the same approach*. This last statement is also valid, since we know that futures research in socialist countries was in service to socialist planning, while futures research in Western countries was connected to civil democracy and/or to democratic planning[2]. The selection of the research topic and the tolerance among futurists grounded for the independence from social systems and ideologies. Science and technology, the future economic development of countries, or the forecast of the growing and developing potential of the world, were typical research topics that were important for every kind of societal structure and ideology, based on the general idea that growth and development were in the spotlight. *The tolerance of futurists was founded on the idea that science is free of value judgement and it serves progress.* If we deal with the future on a scientific basis, then ideological confrontations and discussions could be eliminated. The above-mentioned change of international and local environment in society fostered the increase in tolerance.

Futures research developing into an individual area of science was taking place with more processes facilitating each other: it was helped by the future oriented social praxis that defined its new and unique needs, and also by the fact that dealing with the future in science had its predecessor, besides the predictions of the specialised disciplines and forecasts of prognostics. Futures research became a new and individual research area in

the 1970s and 1980s with scientific research shops, international organisations, scientific journals, specialist books and textbooks, using science's ideological neutrality and concept of serving social progress. The cultivation of futures research created an inspiring environment for the development of its specialised discipline's specialities and its own paradigm.

Until the 1980s futures research overviewed and structured its theoretical and scientific basics, such as its methodology and the various tools of methods. According to the main scientific wave it gave a *positivist answer to the question of how we should deal with the future*. The subject matter of research was future that materialises later. It drew a conclusion to the future based on knowing reality and the tendencies of development derived from that. The possibility range of probable futures was founded on probability considering also the uncertainty of the future. Positivist futures research methods were gathered from the science of revealing reality, but it also had individually developed methods. It supposed that its forecasts were used to shape the aims of practice. As a result of the development of this scientific approach, methods and their application in relation to constructing forecasts on a scientific basis became a regular activity at different institutional levels, which also included national and international institutions.

Table 1. **Matrix of the positivist futures paradigm**

Components	**Paradigm characteristics**
Comprehension of the future and the world	The future that materialises later, that connects to the past and the present genetically, and the objective world is knowable with observation and thinking
The futurist's and their community's situation	Observant
The field of inquiry in futures research	The future of society and issues concerning the future of human beings, complexity and dynamics
The objective and task of futures research	Gaining preliminary knowledge about the future, forecasting the possibility range of probable futures
Methodological principals	Complex problem treatment, dynamic modelling
Rules for method application	The various procedures' and methods' – both the objective and subjective – associated usage

The 'worthwhileness' and usefulness of futures research results	Verification, reliability and fulfilment

Not noticing those futures that do exist in the present is a blind spot of the positivist futures research paradigm, because it interprets future itself and the knowledge of the future only for the forthcoming times. This causes an incapacity to deal with human activity as an effect on the future, to decide whether choosing futures has any significance, to deal with future shaping originating from individual endeavour, or to see the extent to which social values based on different cultures influence the future and the forecasting process itself.

Despite all the success the beginning of the 1980s and in the 1990s, futures research encountered critical times. Most of the forecasts of the 1970s and 1980s were not standing in good stead, because there were unexpected turning points, new and unwonted phenomena instead of the forecasted consequent futures and their variations. These included the oil crises and the economic downturn that followed, in addition to the collapse of the socialist system. Disappointing results meant that decision makers became increasingly dissatisfied when more forecasts did not prevail as thought, and so these forecasts had also lost their power to be supportive for decision-making processes. In addition to the fact that forecasts had not materialized, they were also leading the attention of decision makers to events that could not have followed after such decision making situations, neither at the national, nor at the international level. For example the Club of Rome's forecast preferred zero growth, or there was a normative future image that was characterised by sustainable development (*Meadows et al*., 1972, *Our Common Future,* 1987). Decision makers and the employers of the forecasts were right in feeling that forecasts did not help them in making better decisions. Under these circumstances futurists had to come up with long and complicated explanations with regard to what futures research really was, what could be expected from forecasts and why forecasts did not prevail.

During times of accelerated changes and the even more obvious instability, societies reacted differently to forecasts' capacity of foreseeing and supporting decisions. *Objection to forecasting escalated, it was also declared unnecessary, however there*

was a strong need to forecast expected changes, even just for the short term. New questions emerged as a result of practice, which could not have been answered within the thinking of the positivist futures research paradigm, or if it could, practice would not have accepted such answers. The following are some examples of those questions: Do we have the possibility to decide and choose at all, or are we drifting with the events? Can we have an effect on the future at all? Can we know ahead at least those that we cannot avoid? At what level can we decide about the future, if we can decide at all? How will we shape the future so as to be unique and to belong to us, if we think that in fact we are also responsible for our future? Who exactly, and what institutions at which level may have a role? and what kind of role could they have in shaping the future? Is the future based on one justified value system, and is it possible to create a solid, coherent future image, or only thinking in partial futures based on different value systems is the only possibility in a strongly differentiated world?

Discovering these confrontations *futurists became aware* that futures research and forecasts were not well communicated, and laymen and decision makers were both uninformed: they had different expectations regarding futures research moreover futures research had a different answer for them. However it became clear that the way the world operated had changed. Instability and sudden changes disturb the course of life and the flow of events. All these factors inspired futurists to self-analysis and to rethink their work, how did they examine the future? what did they really undertake when making a forecast?. *The position of futures research and forecasts in the 1980s and 1990s and the reaction of futurists and the employers of forecasts typically show the circumstances of a paradigmatic crisis, and that the way out of the crisis is through a change in paradigm.*

Throughout the 1990's self-reflection, the collection, evaluation and development of theoretical and methodological experiences *gradually became characteristic of the cultivation of futures research*. Self-analysis and self-reflection were interconnected to the overview of evolution of futures research and the way it had been passed on, in the classification of future concepts pictured in forecasts and in forecasting methods, in addition to the review and re-evaluation of the possibilities of using forecasts (*Hideg*, 1992). We can say that these are the normal tasks of every scientific activity; this is not peculiar, because science evolves in this way. However from these reviewing and

developing studies we can heighten those research trends that reflected the changed circumstances and the critics of futures research, as well. *These studies throw new light upon the goal and the social role of futures research, moreover have guided the cultivation of futures research towards new research perspectives.* The research perspectives renewing futures research appeared in connection with the search for a new concept of the future, with turning to possible future interpretations different from the present and its trends, and with the recognition of the future-shaping role of social actors.

Throughout the 1990s and the early 2000s theoretical discussions and the exposition of different viewpoints were somewhat underplayed, and those forecasting projects, methods and method developments which elaborated and solved the realisation of various new research perspectives got to the foreground. *Paradigms stemmed from those researches within the new research perspective that could react to the post-modern change of era and the spread of the idea of a post-normal science at the same time* (*Hideg, Kiss, Nováky*, 1998). The post-modern change of era brought the strengthening of globalisation and the valorisation of locality at the same time. Both of them go hand in hand with the rising importance of freedom of social actors and stakeholders and with the re-evaluation of the future in the present (*Kiss*, 2005). With the re-evaluation of the social role of science, post-modern trends of thoughts and the idea of post-normal science put forward the social utility and expedience of scientific results within the changed circumstances.

Futures research recognised that *even though it is not possible to forecast the future, it then could in fact help social actors', stakeholders' activity in shaping the future thinking individually or in a group, if studying the future being shaped in the present draws attention to possibilities and risks, and/or supports the development of future orientation and future thinking of actors and social groups with its research results.* This recognition was the reaction to the new circumstances and social needs.

Evolutionary and critical research perspectives of futures managed to find new methodology and new ways of cultivating futures scientifically upon the new social assignment (*Hideg*, 2002). The futures field that concentrates on the future that exists in

the present in thinking and in emotions was not called futures research, but futures studies in the English literature (*Masini*, 1993).

Evolutionary futures studies[3] focuses on the complexity and the simultaneously determinate and indeterminate characteristic of the future. The futurists as observant and the acting participants use general evolutionary theory as a world view and as a heuristic. They examine the subject of research, which contains the human factor as well, holistically interconnecting each other's perspective. Evolutionary futures studies, examines the new possibility range of futures within a different context using the generalised concept/metaphor of evolution for the movement of self-organizing and emerging social complexities. *As a consequence it assigns the possibility range of futures arranged in evolutionary patterns.* It breaks with the positivist approach, assuming that forecasting probable future is not possible within unstable circumstances. Subsequently from its approach, preliminary knowledge on the future could not be gathered. All knowledge that refers to the future is reflective, that could be falsified only partially, and then should be set to be reflected again.

Evolutionary futures studies has *hypothetical future thinking* as it considers possible emerging and declining or even catastrophic futures too. In a certain subject and space-time it considers possible to form scientifically based concepts about the possibility range of futures, the alternative futures and the processes that take place within them. It *keeps future open notwithstanding any research results*, because future could not be foreseen according to events, or the human-social reactions and actions. That is the reason why future should be explored through the study of future possibility.

Table 2. **Matrix of the evolutionary futures paradigm**

Components	**Paradigm characteristics**
Comprehension of the future and the world	The future is dynamically complex, determinated and indeterminated, the human factor is also part of it, revealing evolutionary possible futures with knowledge, creating new knowledge and reflection
The futurist's and their community's situation	Participative observant

The field of inquiry in futures studies	Issues relating to the future of society and mankind, self organisation, emergence and complex dynamics, which the human factor is also part of
The objective and task of futures studies	Reflective interpretations and theories about possible futures, and their inclusion in social communication
Methodological principals	Holistic point of view, thinking in evolutionary patterns
Rules for method application	Combined use of subjective methods and evolutionary models
The 'wothwhilness' and usefulness of futures studies' results	Setting in the process of (partial) falsification and reflection, reflection of the reflected, trial in practice, possibility of pursuing the research in concrete space-time

Critical futures studies[4] focuses on the future existing in the present and on human foresight. Its starting point is that foresight as a human capacity is an evolutionary capability; hence it works for every human being. Man deals with the future with all of his mental capacity, thus his future thinking consists not only of clearly conscious and rational thoughts, but also of emotions, faiths and beliefs. Man lives in community and so is able to deal not only with his own future, but also with his community's. Critical futures studies is interested in this last topic: how do ideas relating to the future and common future thinking emerge, moreover how they could be shaped.

Critical futures studies sets futures fields in the transformational cycle of community level's future thinking. The task of futures studies is the critique of community's future ideas and the development of such methods that could help begin the shaping of the community's future ideas. The critical futurist does not make forecasts, but organises and supports the foresight process. The process and its results, future ideas are considered good and useful if they are transparent, controllable and can be repeated, accepted by community, and considered to be reflected by other communities, and other communities really do reflect them, thus the social discourse about the future is a free, continuous and open social learning process. Therefore critical futures studies has a subject, human thoughts about the future, that are examined by the participant, an

observant critical futurist, and the existing and forming techniques and methods shaping concepts and ideas of the individual and society are used and improved.

Critical futures studies does have, and at the same time does not have an actual future thinking. It does have it, because it is embodied in several future ideas, in futures case studies and as a result of future workshops of the practice. However on the other hand, it does not have an actual future thinking, because as a consequence of its main point, when elaborating on the expectations about the future, future images and strategies are not the task of the futurist. A Futurist as a participant observant can influence future thinking with analyses and criticism, moreover the futurist can develop and use methods to elaborate different future shaping ideas.

The output of the critics and workshops differ in space and in time, so there is not a synthesis of one future idea, unless considering the fact that they are all motivated by overcoming and restructuring the relation system of the industrial age. However this kind of synthesis does not even cross the minds of critical futurists, because they all agree that the age of big narratives has ended. Critical futurists do not have an actual future thinking but an *action program* that includes *continuous critical activity*, and the *development* of critical methods and approaches, and the *methodology of participatory foresight*.

Table 3. **Matrix of the critical futures paradigm**

Components	**Paradigm characteristics**
Comprehension of the future and the world	Future is part of the human world, is existing in the present, and is a thought, emotion, faith and belief that is continuously constructed by people and their communicational interactions, that influences the present activity; future could be interpreted and improved by learning
The futurist's and their community's situation	Participant observant
The field of inquiry in futures studies	People's and their groups' relation to the future, formation of ideas and relations about the future of communities
The objective and task of futures studies	Participation in the social transformational cycle, support of forming future thinking at community level

Methodological principals	Communicative simulation of critic and transformational cycle, placed in context
Rules for method application	Combined use of subjective methods
The 'worthwhileness' and usefulness of futures studies' results	Becoming subject of social discourse, transparency, controllability, repeatability, acceptance at community level, reflection on the reflected

Both of the paradigms have materialised blind spots. The evolutionary futures studies' paradigm does not define the extent to which the human factor plays a role in consciously shaping the future and sustaining changes, moreover the extent to which these two roles have changed. Therefore the paradigm does not define when the individual and the community are active, when they are passive observant, and when they are sustaining, moreover when studying each complexity's future what is the proportion of these two statuses that relate to each other. Thus the paradigm could not answer the question of why and how human factors change its two positions in the complexities. *The critical futures studies' blind spot is given by the fact, that critical futures studies concentrates on deconstructing and reconstructing future ideas, and it does not consider as its subject, research how each future concept forms other areas and other communities of the society, the life of the individuals and the world outside of society.*

Table 4. **The renewed paradigm tools of futures fields**

Positivist paradigm of futures research	**Evolutionary paradigm**	**Critical paradigm**
	of futures studies	
Future in the future	Future in the present	
Future is determined but can be influenced	The future is open and can be constructed Future is constructed by human, social actors	
Futurist is observant	Futurist is a participant observant	
Search for probable futures	Study of possible futures	Study and construction of acceptable/preferable futures

Exploration and projection of development tendencies by conditional plausibility	Exploration and study of evolutionary patterns	Participating in shaping human foresight
Modelling simple dynamism	Modelling complex dynamics	Critic, social/post-structural discourse
Scientific support for decisions of community and for policy	Science contributes and supports the future idea construction of the actors	
Human factor's future shaping effects could not be studied	Change in role of human factor as active participant and passive side could not be studied	Effects of acceptable/preferable futures on other communities, individuals and on the non-human factors of the future could not be studied

Futures fields, during its development until today, have formed three paradigms according to the social needs that it reflected. *With the positivist paradigm it satisfies the need of knowing the future in a preliminarily form. Evolutionary and critical paradigms both allow futures fields to support the future shaping activity of the actors that form the future.* The renewed future fields do not give preliminary knowledge about the coming future which occurs later, but supports to shape present thoughts about the future by exploring the evolutionary patterns and/or with the critics and improvement of future thinking.

The capacity of futures studies to solve problems and its possibility to change

The dynamic and comparative analysis of futures paradigm shows that there was a paradigm shift in futures studies. With this shift futures studies has discovered the future that already exists in the present and its role played in societal future shaping. It has also changed its world and future concept, and its idea about the place and role of futures studies and futurist too. The future of society is not formed by laws or development tendencies, but by the activity of societal actors. The compass for action of social actors is their thinking about the future. Scientific futures studies does not forecast the future, it rather supports actors of society and individuals to improve their positive attitude to the future and their future thinking. Futurists have scientific tools to study ideas about the future and their materialisation or non-materialisation, in addition to the role of other future shaping forces and factors. The futurist can be a participant

observant and has the possibility to deal with the future according to a new paradigm. The two new paradigms of futures studies resulted from the paradigm shift *allowed futures studies to refine and adjust its goals, tasks and the way to reach and solve them, according to changing circumstances and needs. The capacity of futures studies to solve problems has risen with the appearance of these new paradigms. The paradigm shift occurred according to Kuhn's concept (Kuhn, 1962)* because both evolutionary and critical paradigms of futures studies have overwritten the paradigm matrix of futures studies according to the paradigm matrix of positivist paradigm.

If we follow paradigm history's change in time we can see the following *periods: the 1970s and the 1980s: the beginning; end of the 1980s and the 1990s: the paradigm crisis; the 1990s and the early 2000s: paradigm shift*. The present competition of paradigms can be considered as a period of preparation for a new paradigm crisis, in which futures studies form new paradigm(s) answering to upcoming societal needs. *The history of futures studies continues with a new paradigm crisis, followed by a paradigm shift, according to Kuhn's pattern of scientific evolution* (*Kuhn*, 1962*).*

If we consider that the paradigm shift did not entirely follow Kuhn's pattern, because the positivist paradigm was substituted by not one but two others, then the present competition of paradigms could be considered part of the process of the paradigm shift. We can suppose that *the first paradigm shift would finish when one of the two paradigms would overcome the other*.

Futures studies has a set of paradigms that consist of three paradigms. With the paradigm shift and with the appearance of the two new ones, futures studies has a greater capacity to solve problems. Futures studies' set of paradigms faciltates the solving of problems, using forecasting and foresight tools. Futures studies through paradigm shift *has also become a post-normal science* (*Funtowitz, Ravetz*, 1993), because its practice orientation, its capacity for reflection and self-reflection and for considering users' viewpoints and evaluation have grown. *Futures studies' post-normal scientific approach would not have been able to be completed, regarding the interconnection of different practical experiences and theoretical futures knowledge that are continuous and also evolve each other (Hideg, 2007).* If we consider that with the paradigm shift futures studies has become a post-normal science, we must admit that

futures studies is unlikely to again become a science with one paradigm The process of futures studies developing into a post-normal science has not yet finished, hence the gap between theory and practice could be a catalyst for the evolution of futures studies'. *The elimination of the gap could help generate a new paradigm shift and the development of new paradigms.*

The two paradigms evolving after the paradigm shift are alternative and theoretically complementary. They are alternative because their answers to the future shaping role of human factor are both possible and also theoretically complementary. Evolutionary paradigm answers the question concerning the role of human factors in the complexity of the future and in the shaping of evolution's cultural-societal pattern. The critical paradigm supports the improvement of the future thinking of individuals and societal groups, because within that paradigm societal actors shape the future of society according to this paradigm. While the evolutionary paradigm focuses on possible futures, the critical one concentrates on acceptable and preferable futures.

After the paradigm shift the evolution of futures studies has been characterised by the competition of the two paradigms. *Competition has accelerated the perfection of both paradigms and their spread in practice.* None of them could beat the other, throughout the paradigm competition, indeed there are many undesirable effects of the competition as well. Undesirable effects include the moderation of communication between those futurists who work along different paradigms, the new mentality that aims at beating each other, and the secession of several foresight activities, like autonomous foresight (*Keenan*, 2006)[5] or praxis foresight (*Hideg,* 2007) did. The tendency of introversion and enmity is detrimental as it distracts futurists' attention and capacity from responding to societal challenges. The gap between futures theory and practice is based on communicational problems between the representatives of the paradigm as well (*Hideg,* 2007). *Futures studies could have overcome its detrimental form and the harmful effect of paradigm competition, if its self-reflection would operate in relation to its reflection. So it would also give attention and reflect the hanging needs of practice, and that would give possibility to a new paradigm shift which would definitely not bring another competition of paradigms.*

The blind spots of paradigms show that futures studies is not able to manage problems of the future with three paradigms. *Futures studies can raise its practical utility even with these three paradigms, if it uses its tools of paradigm to form a new variant of paradigm. In this way the development of futures studies can be shifted into a variational-selectional scientific evolutionary track (Popper, 1972).*

The appearance of blind spots in a paradigm illustrates that the blind spots of former paradigms could be eliminated. If we systematically search the possibility to *eliminate blind spots* of the two new and alternative paradigms, then we can *make a recombination of paradigms according to a selected external point of view*. Studying the reactions to new challenges could create the external point of view. The alternative paradigms are the ones that could be appropriated to this restructuration, as they are also complementary. This kind of restructuration could bring the contentual modification of the components of the alternative paradigms, thus a *successful recombination could bring another paradigm shift. The paradigm shift that follows the recombination raises the capacity of futures studies in dealing with its tasks, as well as making it possible for futures studies to switch its variational-selectional evolutionary track after the new paradigm shift (Popper, 1972), using its enlarged paradigm tools.*

The interdisciplinary nature of futures fields (*Hideg*, 2008) has had a paradigm-generating role in the formation and change of paradigm. Futures studies was established in a positivist paradigm, by the representatives of positivist sciences, indeed the representatives of the social sciences and humanities had a great role in the paradigm shift and the formation of the two new paradigms. In the competition of paradigms well-defined and specific futures paradigms were developing, that has started to resist always-upcoming external interdisciplinary effects, and has been able to take part in other interdisciplinary researches with its own paradigm[6]. As a consequence we can appoint that *futures studies is able to do development on its paradigms,* but for this the futurist must inevitably regularly educate himself. *This process does not prevent futures studies from widening its view and refreshing its methods along interdisciplinary lines it does however give it more space to be scientifically influenced by internal effects rather than the external ones.*

Table 5. **The paradigmatically possible futures of futures studies according to the complex meta-analysis of paradigms**

Factors that influence the dynamism	**Possible futures**
Tracking the changes in time	Emergence of paradigm – crisis in paradigm – paradigm shift – the process of change in paradigm is followed by another crisis of paradigm and paradigm shift, reacting to new societal needs
The outcome of the competition of paradigms	A/ the end of paradigm shift according to Kuhn, will result in the victory of one paradigm B/ eliminating undesirable consequences with the interconnected actuation of reflection and self-reflection – a paradigm shift with the development of new, but not competitive paradigms
The fulfilment of post-normal scientific aspect	Eliminating the gap between futures theory and practice with a new paradigm shift and with the development of new paradigms
Using the paradigm tool	Creating variant of paradigms and with their selection running the track of variational-selectional evolution
Elimination and eliminability of blind spots	Recombination subsumed to the external point of view that influences the content of components, that results in a new paradigm shift
The effect of interdisciplinarity	A paradigm generating role in formation and shift of paradigm – in the future the inner own power falls into the line by the regular education of professional futurists

The factors that influence the paradigmatically possible futures within the futures studies project are illustrated by more evolutionary tracks in the future. Any of them could materialise if certain factors become dominant. If all six factors have an effect at the same time, then the possible evolutionary forms could be estimated by analysing those factors that strengthen and weaken, or even contradict each other. In this case there are only three possible evolutionary forms left. *In the first form, the new paradigm shift occurs with the development of new paradigm(s), and during that self-reflection connected to reflection, new blind spots are eliminated (and also the newest ones*

become visible), moreover the gap between futures theory and practice is also eliminated. Futures studies could materialise this way by developing its inner power and interdisciplinarity. The paradigm tool could help it through recombination that intends to eliminate blind spots. *After the new paradigm shift futures studies can shift to a variational-selectional evolutionary track that has a raised capacity. The second form is to overcome one paradigm, finishing the paradigm shift according to Kuhn, using its own inner power. The third form is the variation of the existing paradigm tool, basically with its own inner power, which results in futures studies' shift to the variational-selectional evolutionary of track unchanged capacity.*

Table 6. **The paradigmatically possible evolutionary forms of futures studies**

Evolutionary forms	**Characteristics**
Form 1	New change of paradigm with new paradigm(s) - with self-reflection connected to reflection - eliminating new blind spots - eliminating the gap between futures theory and practice - using its own inner and interdisciplinary scientific capacity path that raises capacity to solve tasks
Form 2	The overcoming of one paradigm completing the paradigm shift according to Kuhn - Using its own inner scientific capacity path that reduces capacity to solve tasks with unsolved problems
Form 3	Variation and combination of the existing paradigm tool - basically with own inner scientific capacity path of unchanged capacity to solve tasks with unsolved problems

The probability of the second and third forms have decreased due to the fact that they include less dynamising factors, leaving the following questions unanswered: how the gap between futures theory and practice, furthermore all their blind spots could be eliminated? furthermore how interdisciplinary lines could be used to refresh the concept and methodology of futures studies. Both forms are followed by narrowed futures studies, and the loss of its interdisciplinary character. It is a thread for the third form moreover if futures studies would vary and combine its paradigm tools with great flexibility. Both forms proceed toward a paradigm crisis, because futures studies is not able to flexibly respond to the new challenges with one paradigm and with its restricted paradigm tools.

The possible evolutionary tracks that raise the capacity to solve tasks and the interpretation of integral futures studies

The possibility of the first evolutionary track is more expounded than the others, because it includes most of the factors that induce the dynamism and the interconnection of the paradigms, thus it makes it possible to define integral futures itself. It is impossible to foresee how and in what combination of the evolutionary track's dynamising factors that raises the capacity to solve tasks could materialise, hence I will not describe that. However I will draw attention to the significant role of the developing activity of futurists and of those who arrive from other disciplines in the materialisation of the evolutionary track. I am concerned *how one integral futures studies could be constructed with these 'ingredients'*.

For this exercise I will *first select one external point of view* concerning new societal needs, to which futures studies should react. I will then analyse *whether the factors that induce the dynamism of the paradigm subsumed to the external point of view could be formed and connected, making the recombination of the alternative paradigms and the formation of new paradigms possible, that are able to manage the process of futures studies, and its development into integral futures studies.*

Sustainability, democratic participation, new societal needs in relation to the continuously widening creation of knowledge

The challenge for futures studies in the early years of the 21st century is that societal practice has faced great instability, with regard to the risks human-societal formability and its limitations of the future pose. Knowledge, varied in nature, the scientific, the empirical and the tacit should be continuously connected in all fields of life, built within each other, to create new knowledge to sustain community's and humanity's and their environment's existence and prosperity. In this process of creating knowledge, human, community organisation, environmental, technical and economical problems should be handled together and interconnected to realise real time subsistence and sustainability. At the beginning of the 21st century societal challenges became especially important in

three fields: sustainability, democratic participation and the problems of creating new knowledge.

In the years following the Millennium it has become evident that dealing with environmental issues could not be postponed. The possibility of global climate change raises more and more questions (*The IPCC Assessment Report*, 2007), and besides this other environmental components do have a worsening status (*Global Environmental Outlook*, 2007). Sustainability and the passing to the way of sustainable development should be taken seriously at a global and at a local level as well (*Jackson*, 2009). The exploration studies of environmental degradation and climate change show that human effects have a definitive role in unfavourable changes. Societies could act for sustainability only if they get to know those mechanisms of action that function within the environmental changes and the societies' need to satisfy actions, placing human interference in the mechanism of action. *Dealing with sustainability emphasises the analysis between environmental and human interactions, and their foreseeing and planning.*

Democratic participation is becoming increasingly important in the operation of global and multicultural societies. Wars and violent conflicts as solving societal problems could be eliminated by widening the democratic participation of individuals and societal groups. Developing democratic participation is an important goal in modernising the operation of political, economic and social institutions (*Pateman*, 1970, *Heinelt and et al.*, 2002, *Barber*, 1984, *Hippel*, 2005, *Bezold*, 2006).

Democratic participation is based on interactivity between individuals and social groups. Leydesdorff appoints that this interactivity represents the functionality of post-modern societies (*Leydesdorff*, 2001). New solutions for problematic issues gained with interactivities between individuals and individuals, as well as individuals and groups, in addition to groups and groups show how society works. Democratisation developed by participation does indeed belong to the category of societal evolution. Democratic participation expresses a new position for individuals, in which they are able to affect their own living environment and their own societal position (*Barber*, 1984, *Baiocchi*, 2003).

The *continuous and widening creation of knowledge* is the focus of contemporary societies, because *new knowledge is needed to realise both sustainability and democratic participation as well*. New knowledge is not only created by the social elite, but also by all individuals in society (*Gáspár*, 2009). Additionally new knowledge has to be organised and created within the process of participating in interactivities. The creation of new knowledge is not only a continuous action, but also a part of a reflective societal learning process (*Bandura,* 1986). This means that new and socially useful knowledge is put into context and is creative. New knowledge evolves in specific problematic situations where new knowledge is shared among people, hence knowledge integration is realised. Thus *the key issue of societal evolution is the development of such individual and societal knowledge base, which has a very strong interconnection.*

The three new challenges are interconnected by interactivity. Interactivity shows the characteristics of the dynamic relations and interconnections of the world, in addition to the importance of human factor's new role in interactivity. Living in a state of interactivity demands that we are aware of how to act in certain situations, furthermore *how we can become creative as components of different complex systems*. We should be able to define our place in a complex system, to communicate, co-operate and interpret the signs, answering with reflection, thinking and acting with responsibility according to our situation. Moreover we should be able to estimate the possibilities of the complex system's components' reactions to our ideas and actions, and the changes the other components' reflective answers induce in our own situation.

The net of interactivities have a different nature, and living in them the individuals' and society's knowledge that could evolve, that is practice-oriented and that includes foresight has become more valuable. That is why the three challenges and their consequent issues become research topics in the research of sustainable, knowledge-based, interactive and societal networking models. These societal models have also resuscitated programs on societal development (e.g.: the knowledge society program in the European Union (*Europe and the Global Information Society*, 1994, *Memorandum on Lifelong Learning*, 2000) or the educational or vocational development programs (*Hideg, Nováky*, 1998)).

Futures studies reacted with continuous participation in the research of these issues. There are many forecasts and foresight activities on these challenges and their partial problems. Futures studies is very active in revealing environmental problems, and in shaping the future model of sustainable society, knowledge society and interactive society (some examples for further reading: *Meadows et al.*, 1972, *Our Common Future*, 1987, *Malaska*, 1991, *Rosnay*, 1979 and *Eder*, 1997 and *Hideg*, 1999*). These activities are very important but not enough to react to challenges. Futures studies should also react to challenges with the development of its own activity, because the capacity of creating, foreseeing knowledge and its continuous creation are elementary in relation to interactive human existence.*

Interactivity and the interpretation of integral futures studies

The main point of the challenges is the real-time realisation of complexly defined by sustainability and the extension of individuals', communities', social actors' participation in relation to knowledge integration and the creation of new knowledge. Futures studies should also react to interconnectedness of tasks with the development of its paradigms.

Sustainability is not just an upcoming research topic, but also a *new world view* as it considers that interactions of evolutionary systems of different nature are specific functioning systems in itself. This functioning system is specific as the evolutionary systems that participate in the interactions do indeed preserve their capacity to function and evolve also after the series of interactions, they do namely change in a form of co-evolution, which in due course means that several systems are the successful survivors. This concept of the world's dynamism is human centric and is optimal only from human aspects. Apart from the already interpreted optimisation, we can see that behind this *there is a world view that supposes that cultural-societal systems and the system that shapes its environment are interconnected, that they indeed shape each other in mutual interaction. Their mutual movement is defined as co-evolution (Csányi, 1999).*

This world view is different from futures studies' evolutionary approach as this considers the environment(s) of the society as an evolutionary system as well. However this is not a great difference, the concept and world view of futures studies must be

modified to be able to consider the non human environment more than the server of cultural-societal evolution. The critical futures studies have to change its world view as well, not to consider human culture and society as independent from the non human world, and as a system that could be shaped by the actors unlimitedly. If futures studies tends to deal with futures that are co-evolutionarily possible and sustainable, keeping its present paradigms, and tends to participate in shaping concepts that regard these futures, then it will have to modify its view and in consequence also the content of the other components of its paradigms.

Regarding the *participation of individuals, communities and social actors,* futures studies, especially critical futures studies has already reacted and actively taken part in the development and spread of paradigms. Despite this it has to develop its actor/participant relations within the critical paradigm too. In relation to social actors, the hunting and integration of new and possible actors into futures studies should get a greater role and the non human future shaping factors should appear as actors in societal discourse, representing the fact that social actors have freedom to shape their future, even though this freedom is not totally without limitations. Within these limitations the role of non-human factors, like natural-geographical environment, the biosphere, the ecosystem etc. is growing. Evolutionary futures studies has identified the future shaping role of social actors, but it analyses them only in terms of evolutionary patterns and in relation to interconnection with other future shaping factors.

If we consider futures studies' level of development and its characteristics we can appoint *knowledge integration and its recreation* in relation to futures studies, has to develop new knowledge that could interpret the world and its connections of human culture and society within interactivities' changing network, thus this could be used in the shaping of human interactions. *For this futures studies should produce new theoretical-methodological and practical knowledge.* New theoretical-methodological knowledge is based on the integration of new scientific results and its own scientific creation of knowledge. Futures studies could get its new practical knowledge by its new theoretical-methodological knowledge, when it merges scientific, empirical and tacit knowledge values and expectations into acceptable/preferable futures. Besides this, futures studies *has to secure its continuous creation of knowledge and the interconnection of its theoretical-methodological and practical knowledge*. Moreover it

has to maintain its interdisciplinarity and adapting it to its new tasks. In the practice of knowledge production, evolutionary futures studies has a disadvantage, while critical futures studies has problems in the creation of theoretical-methodological knowledge. The continuous creation of new knowledge is secured by the paradigm of critical futures studies, but the evolutionary futures paradigm does not. The connection of theoretical and practical knowledge is unresolved in both paradigms.

To differentiate the creation of theoretical and practical knowledge regarding the future is necessary because of the following issues: Not all practical future work can be raised to a scientific and methodological level, as futures studies would disappear as science. Within these circumstances testing, comparing, reflecting and self-reflecting these scientific results would not be possible. But not all theoretical-methodological research results could become practice, because the individual characteristics of practice would be eliminated in space and time. The theoretical-methodological futurists cannot participate in each practical futures studies work, because they are few, in addition to specific knowledge about producing forecasts and foresight in practice. Theoretical professionals may write handbooks, but there is no guarantee that those people are also involved in the practice. Theoretical-methodological futures studies requires a strong connection with practice, because without knowing how to produce a certain forecast, it is impossible to be self-reflective. *The development of theory and methodology and future practice do all create new knowledge, but they are different in the way in which they are produced and what their validity and competence is.*

Futures studies is able to reflect challenges; interconnected operation of reflection and self-reflection, elimination of blind spots by recombining the paradigm according to an external point of view. The common use of interdisciplinary capacities are all possibilities of development, that allow futures studies to reflection in the case when *futures studies answers the challenges with the development of a paradigm*. During the development of a paradigm, futures studies has to concentrate on the development of new theoretical-methodological and practical knowledge and their interconnection, and it should use complementary characteristic of the two alternative paradigms, and then the development of a paradigm could be made by the recombination of paradigms brought by the contentual modification of the components of the paradigms. The question is whether the paradigms developed in this process result in integral futures

studies. With the new development of paradigms futures studies could be integrated if developing new paradigms along the complementary and interconnected paths that create new knowledge eliminates the undesirable effects of the present competition of paradigms. These paths could be formed by recombining the two, theoretically complementary paradigms. *The paths that create new futures knowledge could be found in theoretical and practical futures studies.*

Theoretical futures studies creates knowledge on future theories and methodology; scientific knowledge referring to evolutionary patterns, and creates hypotheses. Practical futures studies indeed develops and improves the process of creating knowledge, in accordance with the practical work of forecasts and foresights in space and time. Both theoretical and practical futures studies create specific knowledge, so they could be effective if they operate separately but in continuous connection with the other path of creating new knowledge. *Thus integral futures studies is a process within scientific futures studies that with the recombination of paradigms creates a new section.* Indeed we can also say that integral futures studies *is a result of the differentiation within futures studies, which is the separation of several knowledge creating paths, and of integration which is the paradigmatic builder of the interconnections of the knowledge creating paths.* Integral Futures Studies is science with two or more paradigms, of which the paradigms are complementary and could be completed and reflective to new societal needs, only if they are interconnected. Integral futures studies does not stop the competition, but replaces it inside the certain paradigms. Integral futures studies could not be a science with one paradigm as it would not have anything to integrate; it could not be without a paradigm either as there are no common rules of cultivation, lastly neither could its knowledge be integrated. *Integral futures studies is not the end of the development of futures studies, but a new possible period* that widens and modernises the capacity of futures studies to solve tasks by eliminating its blind spots. Integral futures studies widens the paradigmatic tool, and maybe it will be the one that opens the way for futures studies towards a variational-selectional scientific development track.

The idea of *Slaughter* for integral futures could be connected to the integral futures studies developed by meta-analysis in the second evolutionary form, and the integration of knowledge. *Slaughter* in his study of 2008 moves on along the critical paradigm. His

approach states that integration of the knowledge could be realised with the transcendence of scientific and non-scientific future ideas, and with transcendental meditation, that is what he calls integral futures studies (*Slaughter*, 2008). I think that this kind of integration of knowledge does not belong to the interest of futures studies as a science, and the competition of paradigms is not yet closed, and still many requirements to be met.

Some statements of Voros on integral futures studies are very important for my study. According to Voros futures studies could be integrated only when its paradigm is a meta-paradigm, which stays afloat freely above other ones *(Voros, 2008). From this paradigm futurists could select arbitrarily according to situations, in relation to what they would like to study, the goals and the contexts.* A paradigm like this does not exist yet, thus *Voros* advices to grasp the thesaurus of social sciences' paradigms. This idea is considerable: *if futures studies become integrating or integrated, then we will not leave paradigms behind*. As the specific disciplines' paradigms represent different approaches and methodologies, paradigms could be integrated only at the level of meta-paradigms. But *Voros* does not undertake to do that, so he suggests an approximate solution: futures studies as social sciences without its own meta-paradigm could use all meta-paradigms as its own meta-paradigm, and can freely grasp them. According to him *then in fact integral futures studies would admit all point of views, trends and paradigms.* This operation method is not typical of present futures studies, because there is the competition of paradigms, and futurists need some standard requirements for futures studies. *Voros'* suggestion is reasonable and acceptable regarding the fact that *the unproductive competition of the paradigms should be solved on neutral ground.* With this the professional-scientific experience, the accumulated knowledge base of futures studies that have been collected for many years would have been lost; moreover he suggests resumption. That is why I think that if I finish the meta-analysis of the development of futures studies and its paradigms, I can contribute to clarify the paradigm of integral futures studies, and based on that, the interpretation of integral futures studies.

The paradigms of integral futures studies

Based on the train of thoughts that I have just described, I can say that integral futures studies consist of two futures studies that are independent but develop in strong interconnection. *One is theoretical; the other is practical. Both fields integrate and create scientific knowledge.* The theoretical futures studies of integral futures studies develops future theory, methodology and paradigm to explore the co-evolutionary patterns and their change, and concentrates on the changing role of societal actors. The practical futures studies of integral futures studies develop and apply integral forecasting and foresight methods during its practical work, and its scientific activity aims to methodologically solve the integration of knowledge of different nature.

The two fields have a division of labour by cultivating scientific futures studies. The theoretical futures studies develop the science of futures studies, which makes complex study of the development of practical futures studies, and with or without its help produces forecasts and foresights. Practical futures studies use, criticise and develop the results of theoretical futures studies during its practical scientific activity, adapting to certain space-time and exercises.

This division of labour also assumes that there are futurists who are not cultivating scientific futures studies, and whose *profession would be the making of integral forecasts and foresight*. This assumption is not unreal as dealing with the future is quite prevalent at different institutions. Hence the advisor and supporter of future activity has become an individual undertaking, and the foresight manager is an individual job and position in most countries of the world. If science of futures studies evolve towards integral futures studies, then integral futures studies will be able to have a renewal effect on the widely run forecasting and foresight activities in the practice, and that will also be used for developing its theoretical and methodological questions. One of the motivations is the regular education of professional futurists. Cultivating integral futures studies can assure the prepared educators and create a modern knowledge basis and system of professional requirements, which is the theoretical base for the continuation of established and practice-oriented education of futurists.

The two independent fields must have two different paradigms. Theoretical futures studies reflect the new challenges as it adjusts its own world and future view to the forming of a co-evolutionary world view, indeed it also willing to participate in the global-societal program of forming sustainability, with the forming of its own knowledge that refers to co-evolutionary and sustainable future concepts. Towards this it needs to form the future concept, the approach, the methodology and the paradigm of the science of futures studies, furthermore it has to create new knowledge. Developing its own co-evolutionary paradigm solves this task, because the creation of theoretical knowledge adjusts to reality[7].

Practical futures studies reflect the challenges too, as it would like to participate in forming the acceptable/preferable future of sustainability. This task will be completed if it develops different integral forecasting/foresight methods for the new future concept and approach. During this, we will notice the improvement of participation, the connection and unification of scientific, experimental and tacit knowledge of the future, we can also say that the connection of professionals' and laymen's knowledge and expectations of the future. *Its paradigm is based on a participatory paradigm, that adjusts to its own task and that is developed by itself*[8].

Modifying and recombining the content of the components of evolutionary and critical paradigms to suit the aspects of co-evolution, participation, knowledge integration and the continuous creation of new knowledge could form two new paradigms of integral futures studies.

Following the co-evolutionary world concept requires change in the world and future concept of futures studies. *The approach in which the future approach at present and the openness of the future both remain unchanged in the paradigm of integral futures studies as well*. However their content is restructured as the importance of possible, acceptable/preferable interactions of the human system, the systems of their environment rise. This future is a multitude of mental construction that is continuously born in the human world of men/society, that reflect the systems of the environment and themselves; and this future affects and shapes the co-evolutionary processes of men/society and the non-human world by human interactions.

Theoretical futures studies develops the definition, the scientific basis and the exploring methodology of the futures, that are interpreted by the co-evolutionary paradigm. The possible and also acceptable/preferable human concepts should be formed in the practice with the participatory involvement of future shaping actors, in different fields, time and place during integral forecasting/foresight activities. The practical futures studies develop its methodology and practice for different integral forecasting/foresight activities based on the participatory paradigm.

Futurists and their community are participant observants in both new paradigms that do not make any change in the content of the components of the paradigm. Likewise the societal role and general goals of futures studies do not change, thus we can say that integral futures studies support the formation and improvement of society's future shaping thoughts.

The components of the paradigm change in their subject, goal, task, methodological principles, rules for method application, 'worthwhileness' and utility. The subject of theoretical futures studies is the study of the formation and change of the co-evolutionary patterns of evolutionary systems of different nature, and how the role of human and non-human factors and their incidence change in their pattern.

The goal of theoretical futures studies is to create reflective knowledge (interpretation, assumptions, conditional theories and methodology) regarding the human and non-human world's common surviving/further possibilities. Its methodological principles are characterised by complex dynamism, and thinking in holistic co-evolutionary patterns, while its methods are characterised by co-evolutionary modelling and building model systems, and the development of simulations of possible interactions of the emerging systems. The criterion of 'worthwhileness' of the theoretical results is falsification, possibility to improve and to place in societal discourse about the future, and also the *utility in practical futures studies and in the production of certain forecasts/foresights.*

As theoretical futures studies is a *continuous activity of integrating knowledge and creating new knowledge* first, it has to maintain its paradigm – the interpretation of possible futures, the co-evolutionary patterns, the co-evolutionary methodologies – and

has to construct new variants of paradigms. Secondly, it also has to develop its theory on integral futures studies, in order to do that it should study the history of futures studies and the different practices for the production of forecasts/foresight. Thirdly, it should be in continuous connection and interconnection with practical futures studies in developing the methodology and process for the production of forecasts/foresight. This new or emphasised role is not a new component of the paradigm, because it *affects only its operating* form, whether it causes additional research goals, tasks and development of methods.

Table 7. **The outline of the co-evolutionary paradigm matrix of theoretical futures studies**

Components	**Paradigm characteristics**
Comprehension of the future and the world	The future is a multitude of mental constructions that are continuously born in the human world of men/society that reflect the systems of the environment and themselves; and this future is affected and shaped by human interactions the co-evolutionary processes of men/society and the non-human world too.
The futurist's and their community's situation	Observant participant
The field of inquiry in integral futures studies	The possible connection of the dynamic processes of evolutionary systems of different nature, depending on chance, determinism/inertia and the reflective and self-reflective changeability of human constructions of the future The history of futures studies and the different practice of producing forecasts/foresight: self-reflection of futures studies as a science
The objective and task of integral futures studies	Create new reflective knowledge (interpretation, conditional theories and methodology) regarding the human and non-human world's common surviving/further possibilities Self-reflection of futures studies as a science: creation of integral futures knowledge, construction of a new variant of paradigms, maintenance and development of futures studies' knowledge basis, interactive connection with practical futures studies
Methodological principals	Complex dynamism, thinking in holistic co-evolutionary patterns

Rules for method application	Inducing new knowledge on the future with dynamic modelling and building model systems of the connections of the emerging systems, and the simulation of possible interconnections and interactions within the system
The 'worthwhileness' and utility of results of integral futures studies	Falsification, and the possibility to place in societal discourse and in process of construction of the future in a certain space and time, in addition to improvement

On the contrary the subject of practical futures studies is to search for future shaping human actors and non-human factors that appear in the participatory process, to interconnect them and to induce new knowledge among them regarding the future constructional tasks that emerge in space and time. In the process of creating societal knowledge of the future, non-human factors have to be considered, not just as critical futures studies does. In foresight these forms of knowledge that are not controlled and are not developed in the foresight process are in the background knowledge of human actors. In practical integral futures studies these forms of knowledge are systematically developed and used, that is why these forms of knowledge have to be visualised by the actors, adjusting it to the actorial environment of the integral forecast/foresight. With this *integral factor forecasts/foresights will not be the forecasts/foresights of the futurists, but the scientifically based future concepts of the participant actors.*

The goal of practical futures studies is to maintain with different kinds of participation, the cultural-societal and individual cycles that construct futures within the interconnecting process of constructing futures at different levels of communities and individuals. The methodological principle is the organisation of participative future constructions, based on the participation of different actors into a creative learning process. Practical futures studies is subjective in its method application, as it applies and develops the individual, group-based and internet-based methods, moreover these become subservient to them in objective and quantitative methods and model simulations as well. These methods aim to create and control the new and modernised participatory future ideas.

Knowledge created by practical futures studies is not scientific but they are set up in scientifically organised ways and by scientific methods. These forms of knowledge

could not be falsified by all aspects, but are comprehensible, acceptable, criticisable, they are even transparent in their set up. Besides this they have to be useful and developed in other human actions as well, like the realisation as part of a planning process or in using them to maintain the co-evolutionary pattern in theoretical futures studies.

Practical futures studies is built according to a paradigm of one participatory thinking process, where the characteristic of the process is paradigmatically emphasised. Over that this process should be continuous, so the maintenance, development of future thinking is its goal in space and time, and also the development of the process organising methodology, namely the examination of integral forecasts/foresight. Additionally practical futures studies has to be connected to theoretical futures studies as with newly developed future ideas, as well as its methodology.

Table 8. **The outline of the participatory paradigm matrix of practical futures studies**

Components	**Paradigm characteristics**
Comprehension of the future and the world	Future is a process of mental constructions and reconstructions born in a certain space and time of the human world
The futurist's and their community's situation	Observant participant
The field of inquiry in integral futures studies	Find different actors and knowledge, among others the representatives of non-human systems and scientific knowledge, interconnect them in space and time regarding the future constructional tasks
The objective and task of integral futures studies	Maintenance with different kinds of participation, the cultural-societal and individual cycles that construct futures within the interconnecting process of constructing futures at different levels of communities and individuals
Methodological principals	Organisation of participative future constructions based on the participation of different actors into a creative learning process
Rules for method application	Subjective, individual, group-based and internet-based methods to connect different knowledge and create new knowledge of the future, and the use of objective and quantitative methods subservient to the participatory creation of new knowledge

The 'worthwhileness' and utility of results of integral futures studies	Partial falsification, transparency, comprehensibility, acceptability, used in other human actions, possibility to improve, utilisable and explorable for theoretical futures studies

Both paradigms will have blind spots. The following could be expected with regard to the construction of paradigms based on complex meta-analysis:

- within the co-evolutionary paradigm we cannot decide and examine whether a compound system that works and changes in different environments, change and develop due to the interaction between the several systems or by reason of external or internal determining factors

- within the participatory paradigm there is no such rule, how to integrate knowledge of different nature, to be more precise there are rules only for process organisation. As a consequence the context of scientific and reliable knowledge, the intuition and the fears and hopes of the practical integral forecasts and foresights could not be fixed in advance. The different future ideas resulted in practical futures studies are not commensurable in relation to the different nature of their knowledge.

The development and evolution of the interconnected theoretical and practical paradigms could be realised by:

- new knowledge created by theoretical futures studies becoming part of the tangible /methodological knowledge, that take part in certain practical futures studies work,

- certain future constructions of practical futures studies become a source of knowledge and research topic with the cultivation of theoretical futures studies,

- both paradigms' creation of knowledge connected to their own research topic and goals refresh its interdisciplinarity with common research and/or understanding,

- regular education of professional futurists, that create a continuous, direct and living connection between the two ways of scientific cultivation of futures studies.

The blind spots of the new paradigms draw the attention to the fact that both theoretical, both practical futures studies will have to search for new variants of paradigms, to find

solutions that suit their future tasks. For this the paradigmatic tool of integral futures studies that is enriched with two new paradigms could be used.

Summary and conclusions

According to the analysis of the development track of futures fields and its paradigms, and its capacity to react to the new needs of integral futures studies, consists of the joint of theoretical and practical futures studies that have new and independent paradigms, that are interconnected in many aspects and that are co-operating. Integral futures studies is the manifestation of the rationality of the 21st century, of men who create knowledge with foresight and who are active as well. *Integral futures studies is not created by the competition of paradigms*, because it represents different phases of the creation of future ideas of the co-evolutionary and participatory paradigm, moreover developing them could be realised by a tolerant, co-operative and interactive research approach and attitude. *The competition is not over yet, but is transmitting to answer internal questions of each paradigm. The science of futures studies can step the evolutionary form of the variational-selectional model of scientific evolution with a new paradigm shift and with the development/evolution of the interconnected paradigms of theory and practice.* Futures fields' paradigmatic tools and its capacity to solve problems can be further widened with the development of integral futures studies. Its operationalisation is summed up in Table 9.

Table 9. **The widening of the paradigmatic tool of futures studies**

Integral Futures

Reflection: to the co-evolutionary world concept, to the societal participation, to the continuous integration of knowledge and to the needs of creating new knowledge as they are the different manifestations of interactivity
Futures in the present: the ideas about the future of cultural-societal system regarding the intershaping effects of the human system and its environmental system – the future is open

Theoretical integral futures studies	**Practical integral futures studies**
Based on the co-evolutionary paradigm	*Based on the participatory paradigm*
Relativity of independence and interaction between them	

Theoretical integral futures studies	**Practical integral futures studies**
Co-evolution between the human and non human evolutionary system that induce the future	Participation in shaping integral forecasts and foresights
Exploring co-evolutionary patterns; the real and possible/imaginary system of past-present-future and the examination and study of the complex dynamism of their interactivity; development of integral future theories	Exploring and improving the future ideas of human factors/human actors and the circumstances that shape them; enforce the widespread of the participatory principle
Complex dynamism with holistic and co-evolutionary modelling; development of interactive models and model systems	Representing human actors and also the non-humans by humans in the integral forecasts and foresights and their participation in the expanded societal/post-structural discourse
Possible futures in co-evolution, and placing cultural-societal futures within them; forming the scientific basis for practical futures studies activities	Acceptable/preferable futures constructed by participation; forming the scientific basis for integral forecasting and foresight process
Continuous activities	
Maintenance and development of integral future knowledge, possible futures and paradigms	*Maintenance and development of acceptable/preferable futures and the integral forecasting and foresight process*
Observing the interaction systems between human and non-human, and exploring and interpreting the changes in the possible futures' co-evolutionary patterns the exploration of spreading effects induced by the realisation of future ideas, development of future theories, of models and of methods, the study of practical futures activity, development of paradigm	Following up the realisation process and the environment of the acceptable/preferable futures, feedback to induce a new integral forecast/foresight process and to improve the process using new theoretical and methodological knowledge
The continuous realisation of knowledge integration and the induction of creating new knowledge	
Connection of hypothetical and non-hypothetical knowledge regarding the different co-evolutionary systems, and creation of new knowledge of future theory and methodology, contributing to develop the knowledge base of integral futures studies	Creation of knowledge regarding the interconnection and the development of different actors' different knowledge of the future, and their beliefs, hopes and fears, contribution to the development of the knowledge base of integral futures studies
Interdisciplinary lines	
Matching the approach and topics of theoretical and practical integral futures studies	
Sources of blind spots	
Changes by non mutual interactions cannot be examined	The criteria of connecting knowledge, beliefs, hopes and fears are not defined

Theoretical integral futures studies	**Practical integral futures studies**
The connection of theoretical and practical integral futures studies	
Paradigmatic assignment of continuous interactions; setting up regular education of professional futurists	

Notes

1 Here I have to mention some writers and their work that have been very important in prognostics and still have a great impact. Kondratieff's method for analysing macro-statistic data, his theory and methodology for analysing long waves was published in 1922 (*Kondratieff,* 1993). Morgenstern wrote a book about economic forecasting in 1928 (*Morgenstern,* 1828). E. Jantsh published a handbook on the methodology of technological forecast in 1967, R. Ayres wrote a book on using technological forecast in long term planning in 1969 (*Jantch*, 1967, *Ayres*, 1969). Box and Jenkins published a book for using statistical time series analysis in forecasting in 1970 (*Box, Jenkins*, 1970).

2 Géza Kovács and his research group and followers were in the vanguard of domestication of futurology and futures research in Hungary (*Kovács*, 1970, *Besenyei, Gidai, Nováky*, 1977).

3 Developing the evolutionary futures studies Laszlo and his research fellows (*Laszlo ed*., 1991 and *Laszlo, Masulli, Artigiani, Csányi eds.*, 1993), Dator (*Dator*, 1998), Malaska (*Malaska*, 1995) and Mannermaa (*Mannermaa*, 1991) were on top.

4 In developing critical futures Masini (*Masini*, 1993), Slaughter (*Slaughter*, 1995), Inayatullah (*Inayatullah*, 1998) and Loveridge (*Loveridge*, 1998) had a definitive role.

5 Besides communicational problems the *intention of separation and individualisation of foresight activity that adapts serving the one-needed political-institutional decision-making practice* has appeared. This new foresight activity considers legitimate and authentic only its methods, but does not consider itself as part of futures studies (*Country Specific Practical Guides to Regional Foresight*, 2002, *Keenan, Miles, Koi-Ova*, 2003). The idea and methodology of autonomous foresight that is defined outside futures studies could be found in the literature of technological, regional and institutional foresight. This intention of separation is problematic as it doubts the legitimacy of other foresight activities instead of criticising them.

6 Organisational foresight is connected to strategic management and knowledge management too through with the researches and with solving practical problems (*Loveridge*, 1998, *Tsoukas*, 2004, *Gáspár*, 2008 and *Daheim, Uez*, 2006).

7 The concept of co-evolution was first used in the biological sciences and in ecological researches, but there some other denominations for co-evolution and to similar systems of interconnections, like connectionism, interconnectedness or interactionism. These denominations mark that this phenomenon, system and the approach deriving from that has been revealed in different researches and in other scientific disciplines as well. The

co-evolutionary paradigm has *become a meta-paradigm* showing its popularity in other scientific disciplines (*Csányi*, 1997, *Pléh*, 2007, *Leydesdorff*, 2001).

8 The participatory paradigm is such a paradigm of the social sciences that systematises the general rules of the process of societal knowledge creation for practice. It supposes that knowledge is always connected to humans and individuals, and the augmentation of knowledge is valuable in itself, because it serves the completion of men. Because knowledge is always personal, all need to take part in the social creation of knowledge, as equal participants. The creation of knowledge is a process that is embedded in the social and cultural environment. New knowledge will be created if knowledge of the participant grows or transforms, and if it could be improved; and its assumption is equal participation, and a knowledge creating process that is legal, transparent for everyone and reflective (*Heron, Reason*, 1997).

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Endre Kiss

Globalization and the Pitfall of Cataclysms

Theoretical considerations

According to a widely accepted great interpretation, globalization is a science of extensive problems, each of which concern everyone, and humanity in general as well, in new, qualitative, and in their tendencies existential ways. In this sense, the legitimate fields of globalization are e.g. the issues of ecology, raw materials, migration, the global health problems of the world (for they can't be restricted beyond state limits any more), the global positive or negative tendencies of population, energy, arms trading, the drug crisis, or dilemmas of integration and world economy. There is another huge interpretation as well – and that's what we follow in our present work –, which doesn't bind the problems and phenomena of globalization to concrete and singularly appearing 'global' issues (or to a random set made up of them), but examines structural and functional connections of the whole new global situation.

The grades of the process of globalization have always manifested throughout the history of the 20th Century as radical and irrevocable transformations in history and society. This experience has come up at each leap of modernization towards 'globality'; yet a theory of the history of globalization shall be elaborated, which depicts it as a gradual process. First, the grades of globalization *before* the 20th century should be taken by their proper value, as for example the telegraph already fulfilled the opportunity of global action and communication, and had immeasurable effects on international politics and finance even before the 20th century. The correctly interpreted history of globalization is of extraordinary importance for every scientific and other kind of research, because it might distract scientific and everyday consciousness from the intellectual forced course according to which every generation, every decade, every

world-political turn, or significant step in civilization is the victory of globalization(!) over a ‘not-yet-globalized’ preceding state.

The above thoughts nevertheless don’t contradict our definite starting thesis that says the world-historical turn of 1989 is an *outstanding stage* in the evolving of globalization indeed. The primary cause of this is the fact that up to 1989, the mere existence of the two world regimes restricted the process of globalization in the centre, between concrete, down-to-earth limits. Each carefully selected element of globalization could get through the systems of these regimes only by extraordinary efforts. The specifically real-socialistic bureaucratism of Existing Socialism, especially of the Soviet Union, most obviously didn’t fit the requirements of globalization concerning the arrangement of natural everyday processes. This gradually led to various kinds of tension and pressure.

When analysing the great leap of globalization in 1989, we must remember that globalization and Existing Socialism have influenced one another *mutually* right from the beginning. For it wasn’t only that the dynamic forces of globalization shattered the Iron Curtain more and more violently, but there was an opposite tendency as well, as members of the elite of Existing Socialism became more and more anxious about the more and more triumphant achievements of globalization and they felt that they would irrevocably fall behind if they hadn’t join in these processes.

The image of globalization mainly appears both for the everyday consciousness and the intelligentsia as *a new system of power and domination,* as a peculiar and yet undiscovered new kind of ‘centralization’ alike the old centres of power, yet different in its operation. This fundamental vision is right and appropriate in several aspects, and it is also not a coincidence that the ones who took the first signs of globalization with the less enthusiasm were the ones who possess some kind of concrete and real power (which of course was not considered ‘global’). Yet *the real model of globalization* is fundamentally different than these visions. From the point of the philosophy of society, globalization is not a new, rigid and utopist structure of (global) power most of all, but its main point is the fact that the economical, political, cultural and social processes can only take place within the framework of globality. But the primary consequence of this is not an abstract and unintelligible new system of power and dependence, but *a new*

world with a new kind of functioning, a world that is not simply ‘multi-polar’, but straight infinitely polarized.

Globalization is the new latitude for *all* of the actors. The new logistics for the actions possible within its framework get realised in structures of *micro- medium- and macro-levels*. Existing and real globalization creates new social states of affairs in every aspect. *The access to the ocean of globalization is at stake in the fight between subject and subject, subject and group, group and group, or smaller and larger groups.* The structuring power of globalization penetrates *all strata* of social life.

The great *leap of globalization* that started in 1989 and realized one of the possible versions of globalization, i.e. the one related to *monetarism and the international debt crisis,* therefore the all-penetrating practice of globalization shall be related to both the problems of monetarism and those of the international debt crisis. Nevertheless, globalization can intermingle with several other extended social or world-economical tendencies without losing its authentic and legitimate character

One of the most important and also the most difficult fields of the social-philosophical research of globalization is the continual way its *functional and non-functional elements* and moments are interconnected, like the cogs of a machinery. The more the global processes fulfil their global character, the more obviously they feature ‘clearly’ functional characteristics in their operations. For example, the more obviously ‘global’ the structure of world economy gets, the more clearly do the functional theoretical definitions prevail. From a theoretical aspect, functional and non-functional elements are *heterogenic,* but from a practical aspect, they fit into one another in an organic and *homogenic* manner.

Globalization is therefore not a new, yet unknown centre of power, not world-government, but in principle it is a qualitatively new system of the relations of all actors. One of its specific traits is the possibility of access to global processes and networks in a rather ‘democratic’ way. It would absolutely make sense to describe the fundamental phenomenon of globalization with the criteria of *access* and *accessibility.* But this is also the field where we can find the two weakest points of globalization. Globalization demolishes a whole row of particular differences and limits by ensuring

in principle total accessibility. In this sense it is therefore ‘democratic’: the participation in global processes could even outline a new concept of ‘equality’. Globalization that builds from elements of discrimination in its dynamic progress would be a contradiction not only in a theoretical, but in a practical sense as well. The world-historical balance of globalization shall prevail in this connection. *This balance will depend on the final proportions between the democracy moreover, the equality of accessibility, and the discriminative moments i.e. the self-destructive real social processes in the field of the forces of these two tendencies.*

The *second* especially critical problem of the globalization past the 1989 qualitative leap is related to this issue. It is namely only one side of the coin that globalization establishes new relations in a qualitative and manifold sense, while the qualitatively new character of relations is made up right by the fact that the mediums and strata that used to separate the individual from global affairs drop out, and the individual can access the multi-faceted communication of global networks directly i.e. without these mediums, just like any other actor. But the *other side* of this coin is the question whether there will evolve *really* new resources on the side of globalization, which shall be able to fulfil the increasing demands accessibility generates. The triumphant breakthrough of globalization increases the number of resources by itself, but to a much smaller extent than the possible ‘amount of resources’ required for the world of more and more perfect accessibility. The fail of access requirements namely critically deforms the well-built system of global networks. This negative vision resembles the kind of mass-communication that offers a wide variety of TV-channels, while it fails at increasing the ‘resources’ of entertainment and culture in a qualitative sense parallel with the growing accessibility, therefore all it can offer for the increasing demand is low-niveau programs, or endless repetitions of tried and trusted ‘canned’ programs.

The whole of globalization i.e. its essential and specific appearance in its particular functional (sub)systems is a process *impossible to follow for everyday consciousness.* These are specific intellectual problems of understanding the real globalization and its real functional (sub)systems, which are *per definitionem* inaccessible for everyday consciousness.

The representation of the reality of globalization is firstly an immensely huge 'extensive' task for social actors, but secondly, it is also a new, '*qualitative'* task of representing the new functional and abstract qualities of globalization in the *per definitionem* non-functional and non-abstract dimensions of everyday consciousness.

Globalization *as a whole,* as a new world order, or a system of new structural relations cannot appear in the global flow of information the same way particular global problems (e.g. the drug issue) do. The interpretation and understanding of the globalizing world depends right on the capacity to handle these codes. Decoding these new codes is difficult for everyone (although the objects and dimensions of these difficulties are quite variable), i.e. not only for everyday consciousness in the traditional sense, but for the scientific and the artistic forms of consciousness as well.

The problem of decoding the new codes also divides society by the capacity of 'decoding'. For 'decoding' can be interpreted as evolving a capacity to 'access' the processes of globalization to some extent, i.e. a capacity to use the opportunities information systems offer. But there is also another interpretation of 'decoding', which is worlds apart from the former capacity, and that is the capacity of understanding independently the processes of globalization represented in the information systems, i.e. the capacity to 'read' them independently. At this point, the situation of information systems is exactly like that of modern art at the time when modern functional systems appeared. Bertolt *Brecht* expressed this phenomenon by the example that a photo of the building of AEG says nothing about the various functional processes that take place inside the building.

Shaping spatial and temporal structure of globalization

Globalization is the most extended framework of the interpretation of the present. It is a high-level theoretical generalization, and at the same time also an empirical reality anyone can experience. The qualification of the action of each actor can be made on the basis of a preliminary consideration of *concepts of space and time. Re-thinking the problem of historical space and time might be an objective measure of progression.*

This new, threefold aspect also possesses a *coercive* discursive - logical force. For in the evolutionary systems theory, the total absence of *coercive power* and coherence in each particular connection and statement was really relevant. The General Evolutionary Theory has become a popular philosophical theory, but – lacking coercive power – it acquired a strange *tautological* character as well. *'Reality', 'future', and 'progress' do not lie in the intellectually risky cognition of new and unknown facts, but simply in tautologically forcing the evolutionary systems theory upon certain facts or phenomena.*

Many traits of the phenomenon of globalization, but most of all its *actorial* structure are the reason why this extremely coercive and coherent theory and logic have to face the *significant contingency* of future processes, *the strongly limited opportunities of real foresight,* and the *extraordinary measures of some relevant particular actors' degrees of freedom.*

This contradiction might be *decisive* at evolving the paradigms of future research. We have to understand an extremely relevant and totally self-evident *paradox*. *On one side,* we have started a violent fight against decisive methodological schools, mainly for the reasons that their inclinations are tautological, they do not describe their scientific objects as results of complex and sophisticated analysis, but treat their cognitive schemes more or less as ontological constants, so no wonder if they find these preliminarily ontologically defined schemes in their research fields. *On the other side* we arrive to a strict, coherent, and coercive methodology we consider optimal, but at the same time we call attention to its limits, already while explaining it. But the reason of this paradox lies in the new character of holistic relations evolved by globalization itself. It was not evoked by methodological confusion, but on the contrary, by methodological insight. The eternal question of the reference of the method and its object appears here. *There are objects of cognition, which allow only limited results even for the most perfect method.* Therefore our argumentation shall find limited, open, and 'non-linear' answers on the basis of the right methodology. These answers are in fact equivalent with the transition of 'hard' processes of control and communication into 'soft' style processes.

The present is: a mixture of the spacetime-relations of (global) structures, and the spacetime-relations of actors. Whatever abstract – and for the empirical research of

society, even esoteric – this approach might seem for the first sight, it nevertheless becomes one of the most decisive characteristics of the present. The fact that the spaces of the present acquire the *temporal* factor is not new. Moreover, today's discussion is right to inquire into issues of the global regression and devaluation of space.

This object (i.e. *the society of globalization in its theoretical and abstract form*) does not fit into the heuristic space of the traditional theories of democracy or bureaucracy, or even traditional social issues any more, right for this shift in the structure of spacetime. Because for example, neither the principle, nor the representations of the liberal and democratic political structure does suffer any harm by the fact that both the urging power of the creation of simultaneities and the possibility of unlimited spatial relocation lead to a devaluation of all spatial factors, or a higher value of all factors that possess the power of creating total simultaneity or perpetual spatial movement that also converges to simultaneity. Globalization is the final, dynamic form of the (social) temporalization of (social) space.

Neither the traditional, nor the new problem of historical-social spacetime can be solved by the analogy of sciences. And beside the traditional concepts of space and time, new concepts appear as well, which are becoming more and more decisive from the aspects of globalization.

Social-historical time is a *specifically social i.e. non-natural constitution and construction.* Social time is being generated by social life, and not the scientific concepts of time. Social time is generated by the following socio-ontologically general all-encompassing measures:

- physical reproduction,
- temporal components of natural rationalisation and
- temporal components of political power and administration.

Two models have been evolved in the tradition to interpret the specifically historical (social) time (spacetime). *The circular model means, time does not conquer social space (both in the narrow and the broader sense). Although circularity entails the moment of temporality, it perpetually falls back to the starting conditions and thus*

restores them. Globalization fits neither into the circular, nor the linear model of time. It is a totally new quality of spacetime, a totally new situation, a new social spacetime.

This time we have no intention of making a positive judgement (with an ontological demand) on the character of reality. Our intention is only to point out the mere existence of the tension that might hold between the 'sharpness' of the complete theory and the 'opaqueness' of possible answers in principle. We would prefer to describe this new kind of reality as one of an 'uncertain' character (after Heisenberg), but we accept the attributes like 'chaotic', 'non-linear', or even 'soft' as well. Our concrete accomplishments will not be directly determined by these theoretical considerations, as the functional systems of globalization, their dynamic structures and spacetime-relations, and most of all, the measure of the latitude of the 'actors' gives a sufficient positive explanation in the positive and objectively grounded definitions of this character of 'uncertainty'.

The extensive and fundamental approach to globalization seems to triumph in the theory and research of society. There are new types of mentalities developing in the global structure of society.

In social sciences, the scientific *method* they use is always of highest importance. The laws discovered by social sciences mostly prevail only within the closed, protective, but also hindering system of science and scientific methods. *In our present inquiry we attempt to examine phenomena of politics with the seemingly abstract means of the philosophy of society.*

Globalization raises a row of alternatives, all of which need to be interpreted, on the field of *ideology as well as the state, society, and culture*. From the aspect of the theory of science, the theory of globalization is a theory of society, and no matter how many unprecedented new definitions there are on the phenomenon of globalization, it is neither necessary, nor possible to create a new model of theory-making for any of them.

The extensive social-theoretical and philosophical approach to this issue leads further to the sphere of more empirical problems of the philosophy of history and the theory of society. *Globalization is also a fundamental problem of the post-socialistic regime*

change, and thus one of the most important tasks and challenges of Hungarian society as well. An approach to post-communistic democratisation, which starts out from the aspect of globalization, might offer new perspectives of the theory of democracy, compared to the widespread points of view in the science of politics.

As we have seen, the real globalization is neither a new and unknown centre of power, nor a world government, but a qualitatively new system of the relation of every actor, of which main characteristic is 'globality', i.e. the access to global processes and networks in a specially 'democratic' manner. *The relationship of the East and the West changes in the globalized world-society; the roles of debtors and creditors, winners and losers get interwoven in this new world order that is based upon new interdependencies.* In respect to social capital, we have to mention the tendency of a 'downward spiral', which was induced by globalization, and which means that the types of social capital society invest into individuals reduce both in quality and quantity. This is mainly the consequence of the crisis of the public sphere, according to which the evolving of knowledge society could be a remedy for this problem. An approach based on globalization could show the limits of the approaches which have stuck at national development. On the level of philosophical generalization, we can also approach the trends of globalization with the categories *subject*, *practice*, and *emancipation* as criteria.

The theoretical interpretation of globalization shall by no means be built up as a reconstruction of the globalization of one concrete problem (like ecology or arms industry), but it should start out from the whole, i.e. a thorough examination of *structural and functional relations originally are interpreted as holistic.*

The fall of Existing Socialism put the neo-liberal complex of politics and economy in a hegemonous position, and this led to the *illegitimate identification of neo-liberalism and liberalism.* The structural and functional characteristics of the global world are being shaped by this *neo-liberal complex.* In this context, Anthony Giddens' and Tony Blair's Third Way appears as the inequal relation between neo-liberalism and social democracy.

Whether intended or not, the research of globalization extends into the dimensions of the philosophy of history. It slits world history into two parts: the description and comparison of these two great eras resurrect the great constitutional procedures of the classical philosophy of history.

Globalization gets fulfilled in the universe of *post-modern values.* With respect to the history-philosophical method, we do not attempt to define the main characteristics of post-modernism by its contrast to modernism. We break up with the widespread contrast of modernism and post-modernism, because we firmly believe that the essence of post-modernism can be revealed in its relations to structuralism and neo-Marxism. These two streams were emblematic of the philosophy of the sixties. Sometimes they amplified one another, and sometimes they got polemic with each other. By the mid-seventies, neo-Marxism ceased to exist as abruptly as a natural disaster, and around that time, structuralism also recognized its failure. The place of these two great streams was taken by a philosophical vacuum, which however didn't mean a 'philosophers' vacuum', i.e. the absence of philosophers; as there came philosophers who although possessed positions of political power, but no philosophy of their own. As post-modernism was born on the ruins of neo-Marxism and structuralism, it took over the achievements of these philosophical streams which had been relativizing and deconstructing normal sciences, but at the same time it also dismissed their positive aspirations for reconstruction. Therefore, post-modernism is the use of the discourse of cognition without an intention of cognition.

But post-modernism is not the only hegemonous stream (now in a narrower, *also* philosophical sense) nowadays. By the fall of neo-Marxism, *the neo-liberal-neo-positivistic philosophical methodology that was following the Vienna Circle, got into a strategically decisive position in politics as well as in economy and philosophical methodology*. Therefore, today's philosophy is under the twofold hegemony of post-modernism and neo-liberalism-neo-positivism. The most important *symmetry*-relation between these two streams is the attempt to re-regulate the whole process of thinking by the regulation of notion-building and object constitution. But their strategies are opposite to one another: neo-liberalism-neo-positivism sets reductionist verification as its chief requirement, while post-modernism delegitimates verification. However, these two streams have one more thing in common: both the limitation of the scope of the

rules of philosophical verification and its total elimination got realized not through power-free intersubjective discourses, but in the medium of interpersonal power.

There is a simple but so far neglected, however quite decisive fact, namely that *the launch of the processes of globalization and the post-communist regime change took place practically at the same time*. In our opinion this is not a coincidence, but there is a manifold relation behind this simultaneity. The connection between globalization and the fall of communism is obvious, but the analysis of the multitude of its components still awaits future researches.

In respect of neo-liberalism – which is of an outstanding importance in connection of globalization and post-communism – it is a decisive theoretical fact that *monetarism* and *liberalism* are not identical phenomena, as the former is able to function even under totalitarian regimes. Would the communist dictatorship have been incompatible with the monetarism that ruled the world? After the resolute start of *Pinochet*, some weak attempts by *Jaruzelski*, *Grósz* and *Gorbachev* really make us believe this. *Liberalism and monetarism are not necessarily joined together.* Their closeness that made them seemingly identical was made possible by a particular historical situation: the decline and fall of communism. This was the fact that made monetarist theoreticians mix up the social care of Western welfare societies with the 'real Existing Socialism' of Eastern societies, and they found the opportunity of a simultaneous criticism of both systems in liberalism. In this exceptional situation, in which human and civil rights were conspicuously violated in the states of real Existing Socialism, the two – otherwise quite incompatible – aspects of liberalism i.e. economic and civil rights liberalism could be brought together.

The socio-theoretical concept of *globalization* does not mean a new, rigid structure of (world) power, but *a new framework and environment of social action*, in which economy, politics, culture, and all other actors of society are shaping their relations in a new and unprecedented, *originally* global context.

To show all the political factors and value components of globalization evolved from over the totality of political and social reality, needs an extraordinarily thorough and extensive analysis of the total world history after 1945. This is in fact the problem of the

unification of the divided world after 1945, as an actual and real division of the world would evidently automatically exclude any meaningful use of the term ‘globalization’.

The decisive processes of globalization are part of the development of modern rationalism. Yet the decisive process of modern rationality cannot be reconstructed without reference to emancipation, which is also of great historical importance. Rationalization, the ‘deprivation of mystique’ (Entzauberung), the ‘dialectics of Enlightenment’ must appear in a new context. The concept of emancipation must be present also in the history-philosophical discourse of the world-historical ‘farewell’ to myths. All critiques of modern rationality were stated because of emancipation that had not taken place, although its necessity was increasing parallel with the progress of rationalization. *The omission of emancipation might put the process of rationalization and globalization into a critical danger.*

The relation to modernity in a history-philosophical sense is decisive not only from the aspect of potential enemies and enemy images. In a positive sense, it is decisive because *in several important aspects, globalization, which in fact sprung out from the soil of modernity intends to eliminate the so far most important achievements of modernity as well.* It is about the collision of the totalizing, social-democratic type development of the welfare state and its also totalizing, neo-liberal demolishment. For the most typical fundamental characteristic of today’s world is not globalization in its pure form, nor integration in its pure form, but globalization or integration qualified by state debt, which is a specific characteristic of all states.

The downward spiral of social capital is also a consequence of this concrete structure of globalization. And right because this phenomenon is a consequence of globalization, it is global as well. We are not trying to ignore the numerous impressive civilizatory accomplishments, ‘success stories’ of globalization. But right the actually manifested structural characteristics of globalization are the cause of the fact that the *upward* spiral of great accomplishments and the *downward* spiral of social capital do not cross each other. The knowledge component that operates in modern production is part of a broader concept of knowledge capital, while social capital, which is being invested in successive generations does not reproduce itself on the level of human civilization. This also means that *the future shall become the field of the new battle of civilization and*

barbarism, even if none of the definitions of these terms will remind of the concepts of civilization or barbarism that have occured in history so far.

While globalization – for functional and structural reasons – pushes the less versatile and overloaded state backwards and makes the spiral of social capital move downwards, it *provides real space for action* to the *new historical actors* down to the level of the individual. *Under the circumstances of globalization, the latitude and freedom of the action of actors can be extreme.*

It's not easy to build the actorial side into the theory of globalization. First, because it's extremely trivial; it is often difficult even to make it accepted that the free action of singular actions could be a legitimate part of scientific research. Second, because the importance of the actorial side is a less theoretical element, no matter how 'incredible' it is. Third, because the actorial side in its arbitrariness does not always reveal the dynamic structures and functions behind it, therefore stressing it might even seem a misinterpretation. The actorial side underlines the specific 'uncertainty' (in a Heisenbergian sense) of the theories of globalization (and the future), while the functional systems of globalization, their dynamic structures and spacetime relations, and most of all, the extent of the latitude of the actors might provide sufficient objective explanation for a positive and objectively founded description of this 'uncertainty' character.

The *micro-strata* of globalization are scarcely different from the usual micro-circumstances, therefore they cannot be apprehended. The *macro-strata* cannot be apprehended by society either, because – in accordance with the key concepts that have already become universal – they are *virtual, abstract, functional, holistic, and global.* The sphere of decisive confrontations is therefore the *medium-sphere,* which evokes the false appearance as if globalization were no more than a row of collisions.

While globalization provides enormous latitude for the action of the actors, there are hardly any global actors for the representation of individuals organized in social formations. The problem of missing actors is completed with the problem of missing groups of competence. *The task of global competence does not possess any actors, and the global actor does not possess competence.* Neither traditional forecast, nor

traditional consensus-making, nor traditional bureaucracy (administration), nor any traditional 'institutions' are appropriate or able to develop competence legitimately. *This increases the possibility that global decisions might be the most irrational.*

Another important element of the new order of international politics (the 'new world order') is the new interpretation of 'identity' and 'difference'. By 1989, the logic of neo-liberal identity and difference exchanged the basic notions of identity and difference of socialism, as well as those of Christianity. This means *that neither the solidarity of socialism, nor the brotherly love of Christianity can diminish the brutal power of difference*. Neo-liberal identity consists in nothing else but the unconditioned respect and guarantee of the freedom and the rights of the individual (which rights might become merely formal at a certain extent of social differences). In such cases, *difference is not a mere difference, value, or ideology, but it might even become an essential feature of social existence.*

The exceptionally great importance of the difference-moment is made up by the fact that in our age, a divided world has been replaced by a unipolar one. While in the divided world, difference was founded by hidden identity, the concrete contents of the neo-liberal equality of human rights are ensured by unreconciliable differences. *The power of difference is the final character of difference, and its absolute measure.* The power of difference over identity establishes rigid and static states of affairs. If the measure of difference exceeds a certain extent, the dimensions of mediation (communication) are eliminated therefore the two poles of the difference-relation cannot get into interaction with each other. *The total freedom of every actor and a system of rigid oppositions inapt for communication* – this duality is the most important one of the problems that binds the present to the future.

The bias of self-destruction

The end of the Soviet World Regime, Gorbachev's of the Soviet Union as a superpower and its magnificient ideology, became not only a *decisive,* but also an *irrevocable fact* of today's universal history. As *ultima ratio,* it might appear in a different colour in each different interpretation of historical eras. However, its self-evident final world-historical value could hardly be traced back to any other process. Although this concrete

fact of the end of history has not yet lost its universal quality, it seems like this macroscopic, Gorbachevian ‘end of history’ itself is a part of a higher and also universal transformation process. With the end of the divided world, which took place in the blink of an eye, disappeared all ideological bias. At the same time, a new vision emerged: *the vision of a self-destructive society.*

The Gorbachevian ‘end of history’ blasted the ‘moment of truth’ in the society of Existing Socialism. But it is also a cosmic and colossally ironic gesture, a cunning of reason (List der Vernunft), that this moment of truth has become reality for Western societies as well. As the Great Enemy bade farewell, the self-image of Western society was also removed from its overall determining framework of *bipolarity*, which had provided the Western part of the world with a position of comfortable and unchallenged superiority before.

The nearest past of the society was based on good intention, or at least trust in the future – elements welfare society had promoted to the status of an overall political program, a so-called ‘official humanism’. We do not mean, of course, to make the welfare society of the 60’s and 70’s responsible for a society that became more and more self-destructive in the 80’s and 90’s. Yet one followed right after the other.

A fundamental tendency of a self-destructive society is an extent of state debt that makes it impossible for the economy to catch up with it even by the most favourable conjunctural conditions. *Achilles cannot pass the turtle.* The self-destructive society is therefore a society that is unable to maintain (via its own legitimated state institutions) the highly developed *post*-welfare level of civilization. It is originally a question of budget and economy still it is not simply a question of economy. If a coalmine is shut down because of inefficiency, it won’t lead automatically to social self-destruction. But if the state is forced to back out from the fields of education or healthcare, of which it used to be the only supporter, the self-destructive tendencies become clear at once. A bankruptcy in economy is not necessarily self-destructive, while a bankruptcy of institutions that used to be supported by the state is necessarily self-destructive. Therefore the fundamental problem of the self-destructive society is not simply an economic one. *The state debt is not equal with economic recession*. The latter one can namely only be followed by economic boost. The self-identity of the state, the society

and the citizen is seriously questioned from this aspect. Therefore the state, the society, or the citizen either doesn't have an opportunity to improve all-human values, or they are even bound to use up, or even directly destroy these values.

The self-destructive society is the new and extensive reality. It reminds of the general reformulation of the fundamental notions of social life. The 'West', the developed part of the world should be considered the winner of Gorbachev's farewell and it drew profit from the global transformation of world economy. On the other hand, even this 'West' had to struggle against the consequences of self-destructive society, also because of the growing importance of the debt challenge. At the same historical time, the former 'second' world did not get the financial support it needed to establish its new political democracy and new competitive market economy. At the same period, the old or new 'third' world reached the bottom at mass migration and poverty. In this 'post-historical' history, a new question has arisen: can the politically hegemonous liberalism break away from the downward-circling spiral of self-destructive society?

The double function of the post-socialistic regime

The states and societies of the former real socialist part of the world had to solve several, not only different, but straight fundamentally antagonistic problems. First, they had to evolve a real and reliable democratic political system, with all known problems of this 'project'. Second, these states and societies had to take successful and effective measures to reduce or even gradually bridge the critically deepening economic and civilizatory gaps between the West and the East by shaping their own competitive economy.

The two simultaneous great missions of the post-socialistic part of the world are: (1) *building out* a democracy that works, and (2) if not straight solving or using problems of state debt in favour of changing the economic structure. These two, in the major aspects antagonistic tasks have been calling for an international and conscious solution right from the start. The all-time western partners have clearly stated that they did *not* want to think in such a solution. In the post-socialistic societies however, these two huge projects (building out a democracy that works, and handling the problem of state debt) remind of the necessity of such an international and conscious solution time after time.

The two most important projects are in some pragmatic view necessarily antagonistic. This antagonistic relation *fundamentally re-shapes and revaluates even the basic functions of post-socialistic democracy*. Such a democracy cannot realize the ideal type of the democratic system. It cannot fulfil itself; it cannot be a self-justifying and self-supporting basic fact in the reproduction of a more just and legitimate society. So it becomes the most important function of the post-socialistic democracy to *bail out* the economic heritage of Existing Socialism. It becomes the real function of post-socialistic democracy in the circumstances given, to manage the whole debt problem of former Existing Socialism.

Its fundamental function to bail out state debts puts post-socialistic democracy more or less directly into the nightmare of a classic *Weimar type*. If we put it this way, post-socialistic democracy loses its privileged and singularly fortunate character of a general liberation and unveils its extraordinary character. It is so because the main motives of post-socialistic democracy were namely exceeding totalitarianism and the occasion of reaching an optimum of historical dimension. But right after this democracy was born to success, it could get into a *Weimar type* crisis; a row of political crises caused by the bailout, or – on the contrary – huge civilizatory shocks following successful bailouts.

The double function of post-socialistic democracy (shaping a classic type democracy *plus* managing state debt) also appears definitely in the specific raising of the *mechanisms of political decision-making.* While in a democratic political system that consciously accomplishes its historical missions the whole chain of decision-making reaches into the web of society in multiple ways. Therefore it is also ‘building up from below’, and it gains its unappealable legitimation from formal or informal agreements of its elected representatives. But in a democracy that has to bail out debts, obviously the whole technique of decision-making should change. It is because financial decision-making strongly limits the latitude of the decision-making of elected representatives. If the budgets of local governments, governments of social insurance, and other autonomous organizations and associations of civil society get empty, it results in serious democracy-theoretical deficits.

Similar shifts in emphases can be shown in the shaping of social structure as well. The greatest central mission of democracy is the shaping of the more or less optimal social side of an existing democratic structure. However, the fact that the present structure of a post-socialistic society is not influenced and shaped by the new impulses of existing democracy but monetarist restriction, must have the binding power of evidence for everyone.

The two simultaneous and in many aspects antagonistic functions of post-socialistic democracy clash particularly sharply the term *legitimacy.* Post-socialistic democracy – as every post-totalitarian democracy – is one of the most legitimate political structures right from the beginning. But this most stable legitimacy suffers damages each day because this same ('the most legitimate') structure cannot provide a minimum level of vital conditions and chances for its citizens in any era. This alone won't critically weaken the otherwise exceptional legitimacy of post-socialistic democracy. But it would be foolish to think that *the actual monetarism that follows from the bailout function of democracy would not have any influence on the legitimacy of the same democracy.* In this pressing tension namely, two concepts of legitimacy outline and turn against one another, i.e. the (flawless) classical *political-theoretical* concept of legitimacy and the (fallible) *practical problem-solving* legitimacy.

Globalization and politics as a subsystem

Every research of the post-socialistic transition is starting out from totally new and unprecedented universal characteristics of *globalization, virtuality, and post-industrialism. On the other side, contrary to the still unmapped significance and magnitude of these unprecedented new traits stands the concrete appearance of global everyday life.* This unbelievable distance of a holistic and theoretical approach and the microscopic and particular everyday practice creates a specific space of theory and practice.

In this framework, it would be necessary to analyze also the actual relationship of *globalization and politics.* This would follow from the fact that in a strict sense, the politics of the present is not the same as it was a few decades ago. But we are excused from this task by the fact that politics, the political subsystem, and political classes

slowly seem to find their proper new places in the world of globalization (and the new world economy). Therefore a closer investigation of the sphere of politics (das Politische) slowly becomes possible even without enumerating a theoretical totality of the new world-historical co-ordinates.

The double face of democracy becomes a fundamental issue of globalization. On one side, this is a commonly *functional* and *structural* moment. It is because global operation can (could) only evolve and operate on the basis of democratic liberalism or liberal democracy. *In this sense, liberal democracy is the 'modus vivendi' of globalization.* But, on the other side, its functional and structural foundation shall not make us forget the immanent and original *value components* of liberal democracy (like all kinds of human freedom, etc.), which used to ensure exceptionally strong legitimacy for the political system even before the functional and structural dimensions were developed completely.

The fundamentally democratic character of the political face of globalization got expanded by a row of yet unclarified new functions. *Democratic values left the realm of founding values and became pragmatic and constructive components of concrete structures and functions.*

Political contents overlap with each other. The pragmatic dimensions eliminate the distinction between 'left' and 'right'. A great number of social and socio-cultural transitions appear. Each of these factors is quite weighty and serious even on its own, so they make the common use of the old categories critically difficult. The historical shutdown of Existing Socialism also accomplishes its own revaluation of values. In spite of all this, it is no more impossible to define the greatest political initiatives. Giving up the intention of defining the new great initiatives would be dangerous both intellectually and ethically. It refers not only to the 'left'-'right' distinction, but also to that of liberalism and conservatism, and other important conceptual definitions, even the issue of the 'nation' as well.

The whole liberal democracy stands before new, often unrecognized challenges. First, they are the functional and structural foundations of globalization, and second, the challenges of concrete global relations unknown before. For example, the democratic

order is expected to limit migration, but at the same time it is also expected to make it possible and human.

If we define liberal democracy by its aspect that the party that wins the elections controls the operation of state administration and redistribution for a cycle, we can clearly realize a new trend of modern democracies. Possessing the totality of state power means power of a smaller extent and a narrower scope of action than before globalization. The dimension of political power (in the relative extent of power) is smaller, yet the role it plays in answering global challenges is more important than before. A state in the hands of the ruling political party can no more possess instruments of production, neither does it produce. It redistributes the taxes of other producers and it tries to fulfil its tasks that no other player was willing to undertake. But contrary to the weakening power and competence of the state stand the (both absolutely and relatively) renewing demands and pretensions of insatiable individuals and groups.

The present model of the world should be considered *the mature form of globalization*. Its decisive trait (beside several other important definitions) is the phenomenon of *state debt,* which phenomenon fundamentally defines the economic and political framework of globalization for the societies and for human life. This model is fundamental in the development of the deeply monetarist profile of present globalization. This is the general model, in which the extremely extensive process of accession to the EU is taking place. These multiple functions cause that *even the lack of a theory has its own victims.*

One of the great challenges of the future is made up by problems of the *state.* The starting point is the relationship between globalization and the nation state; public consciousness is aware of the new tensions and problems of competence that arise here. From the aspect of the state, the regulation of political and economic processes is also an important element therefore their results are of great importance. The great dimension of the future (and the row of questions to be decided) springs from the fact that *the state is not a neutral actor that can be characterized solely by functional characteristics*, but since the modern state after 1945, it undertook civilizatory and social tasks at an extreme measure totally unknown before, which tasks can only be lifted from the bonds of the state shattered by the processes of globalization by

destroying huge ‘areas’ in the social network. The states are the losers in this process. But there is also another tendency, which also has its first stark signs already in today’s global processes. There are namely also fortunate (nation) states, which could use the achievements of globalization and even integration to *realize their original ends and pretensions as nation states*, or even their long forgotten aspirations to expand as nation states. These nation states are already the winners of the expansion of the EU in multiple aspects, which can also be interpreted as a process of globalization. The accession to the EU hides the dramatic importance of future state functions from public opinion and research, while the absolute and relative decline of the state that – for historical reasons – centralizes every social and civilizatory function in itself, results in several concrete practical difficulties.

The problem of the duality of the political sphere (das Politische) and economy shows also the new quality of globalization. It is a question of theory of systems. If we examined the phenomena solely from the one (the political) or the other (the economical) viewpoint, we would not get to any special conclusion. In this case we would make the new complexes of present phenomena – shaped by globalization – the subject of a past, pre-globalization kind of reconstruction, and instead of using the language the new complexes would require, both one-sided approaches (the economical or the political discourse) would use the language of (exceeded) normality.

If we used the traditional *political* terminology as medium of the inquiry of globalization, we would not just get to an average image of normality, but straight to one of idyllic normality. It emanates the vision of the victory of liberal values, and the worldwide spreading triumph of the democratic order. But if we used the traditional *economic* terminology, the image of the globalizing world might no more seem so idyllic. *All details, relation and dimensions of the economic and political qualities of globalization can be described by the language of normality – except for the fact of globalization itself.*

On the level of macro-theories, the mature form of present globalization is called *monetarism*. We have already justified the use of this term earlier. We are well aware of other meanings of this term, as well as of the factor of arbitrariness when labeling an already complex form of something that had possessed no name before. The fruitful

component of using the term ‘monetarism’ is that it does not only refer to the outstanding importance of global cash flow in general, but it also refers to the gigantic amount of money in this flow and, indirectly, to the eminent importance of global stock markets, and by this, also to the decisive new problem of state debt.

The specific problem by the reconstruction on the micro-level of globalization is the fact that while anyone can sense and understand this micro-level directly, one can only acquire models and patterns that make the well-known micro-level recognizable as the *micro-level of globalization* after a macro- and medium-level reconstruction. There is a set of phenomena, which could be characterized as the micro-sphere of globalization, but its specific micro-sphere can be identified as part of globalization just after a whole interpretation of the macro- and medium levels of globalization.

It is the medium sphere that occupies a privileged position in the theoretical reconstruction of globalization. The medium sphere does not simply show a new side of the phenomenon of globalization, but it shows its most relevant new side, because globalization appears in this environment as the decisive determining factor of the whole social life. On this level do the new functional systems of globalization broadly confront with social life? It is the virtual, but also physical area, *of which system-theoretical functioning penetrates historical frameworks of non-functional nature, like values, contracts or tradition.* As defined earlier, globalization is a state of exceeding a critical mass of functionally operating systems. Now we can understand, why the most dramatic confrontation takes place in the medium sphere, for here does the *functional sphere overlap with the non-functional sphere*.

The present form of globalization is a coherent system called monetarism, of which macro-level definition’s most important conditions we have already stated. Of course, the coherence of the medium-level doesn’t mean a coherence of scientific laws. This coherence is a product of an ever-changing interpenetration and confrontation of huge functional systems and non-functional social and human activities. That’s why this system can change, and its qualities and relations can never be unchangeable necessities.

In the philosophical tradition, the semantics of all decisive terms of political philosophy and political practice was shaped when the political subsystem – *in the pre-globalization era* – self-evidently was far identical with all social theories in general. *In globalization qualified by functional operation and no more by (non-functional, therefore system-theoretically different) politics, the political subsystem is no more identical with social theory in general.* What about the theory of Social Contract or the original Human Rights in a situation when the unconditioned respect towards them although remains, but at the same time, in the real conditions of global monetarism, these rights are obviously violated, while nobody can be made responsible for it either morally or politically!

Because of this new systemic difference happens, the relative *devaluation of the political subsystem* towards all functional systems (mainly the economic one). On the medium-level of globalization, the relative *devaluation of the political subsystem* leads to the revealing of so far *hidden genealogical dimensions*. Who on Earth knew that Marxism that started to decline critically after the 70' – 80's, was still carrying a considerable measure of civilizatory-utopist potential? Who on Earth knew that it was the framework of the nation state that secretly carried the functions of the welfare state? Who knew that it did it in such a self-evident way that as soon as the nation states shattered financially, the whole future of the institutional framework of social politics shattered? Thus the relative devaluation of the political subsystem has already shown that *the collapse of the political sphere also means the devaluation of 'society'* in connection of shaping the most important relations. Moreover, there are some signs that indicate that *the collapse of the political sphere might even lead to the devaluation of mankind.*

The decline of the system of politics – despite naïve expectations – will not liberate society from the conventional organization power and repression of the state. This is because it is right another decisive consequence of globalization-monetarism that the economy, like several other subsystems, can escape from the legal interventions of the state critically impoverished by the omnipresent networks of common debts. On one side, the impoverished state will no more be able to control the function of the subsystems within its territory. On the other side, paradoxically, it must use all of its

energies to control the functions of which existence and reproduction it can no more influence.

Globalization and modernization

The fundamental rise of modern rationality cannot be reconstructed without a historical analysis of emancipation. Of course, this does not only modify the interpretation of the shaping of rationality, but the interpretation of the whole strategy and direction of the historical process as well. Rationality, 'disenchantment' (Entzauberung), 'the dialectic of enlightenment' must appear in a new context. Thus the phenomenon and the issue of emancipation must appear in the historical and philosophical discourse of the 'farewell to the myths' as well. This refers to liberalism as a political concept on a theoretical level and the concretization and manifestation of modern rationality. *Modern liberalism* is the political face of *modern rationality*. The *indifference towards various issues of emancipation was the great failure of liberal politics.* As an integrating political concept, it should have integrated the immanent and necessary moments of emancipation in its modern rationality. Instead of having done that, the present neo-liberalism obviously even protests against issues of emancipation with its indifference and ignorance. The lack of emancipation might thrust the whole process of rationalization into critical dangers.

The collision of the *social-democratic* evolving of the welfare society, its *neo-liberal* demolishment, and their common dynamics fundamentally determined also the historical era that followed. For the most typical fundamental characteristic of today's world is neither globalization, nor integration in its pure form, but is globalization or integration qualified by state debt. State debt, as a decisive moment is first the negative heritage of the welfare state. This is also the moment by which strategic instrumentalization of the monetaristic world order accomplished its own decisive breakthrough.

The global world represents the basic dimensions of the problem of universal values. Its political and social triumph is due to the worldwide victory of neo-liberalism that is based on human rights, and of which values it had made universal in a most evident and seemingly natural manner. The functioning new world order embodies universal real

dimensions, and it does it in the trivial existentially bounded (seinsverbunden) manner of facticity.

The classically new basic situation, i.e. the ‘universality of particularities’, the process of every individual and group becoming a global actor is in a sharply antagonistic position to the rule of universal values. But before judging the universal and at the same time particular universalism on grounds of justice or inequality, we must point out that in the all-round process of the transformation are a great number of components of emancipation and equality in competition. *Without a doubt*, it is a grave new contradiction of today’s globalization that this omnipresence of particular universalism makes the global pretension of particular interests a horrible near danger. This fundamental contradiction is also paradoxical: in a global world that is being constituted by a type of universal values that embody universal operation, every particular individual might evidently become an actor. But such dialectic of transformation to independent and monadic actors might become self-destructive.

In our foresight, everyday globalization cannot compensate that danger even by its evidently twofold universal characteristic (like human rights neo-liberalism and functional universalism). It is because globalization is only capable of regulating the rules of vindicating particular interests to a limited extent. There might start a new historical era of ‘warren, as is of every man, against every man’.

Liberalism and monetarism

In the ‘70s and the ‘80s re-shaped liberal ideas did not appear in their full new splendour *after* a new historical cataclysm. They came at the decline of a worldwide social order that had been defined by special political and ideological characteristics. The similar way did the rise of ancient Christianity accompany with the decay of the late Roman Empire. This unique historical and structural position of liberalism was the *real* antecedent of the most important characteristics of the post-1989 liberalism, and also the reason of the fact that such a seemingly absolutely problem-free symbiosis of ‘liberalism’ and ‘monetarism’ could evolve. Existing Socialism was in defence, and it could not find its proper place among the co-ordinates of a new, globalizing reality. It was the Real Socialism that shaped the whole political, social and also the

hermeneutical horizon, ahead of which classical, human rights-based liberalism and monetarist restriction could and *did* appear as two essentially connected consequences of one and the same theory. *It was namely the 'order' of Existing Socialism itself, in which the 'neo-liberalism' of the critique of etatistic redistribution did not differ from the human rights idealism of classical liberalism!*

Before the horizon of Existing Socialism, the really 'liberal' description of modern market economy seemed to be fully isomorphic with its 'monetarist' description, which new isomorphism accepted an existing political and economic state (i.e. monetarist restriction) of the continually existing Western capitalism (apprehended from the embedded anti-totalitarian perspective) as 'liberalism'. On such a hermeneutical basis, the actual politics of monetarist economy was called 'liberalism' *as an opposite of both Existing Socialism and the Western-type redistribution*. Now the big question is, how the form of market-economy would have been called that should have been initiated in the post-communist state of the '60s! Probably it would also have been called 'liberalism', even though it was about distribution.

Therefore that statement 'liberalism = monetarism' is not only wrong use of terminology, but it is extremely harmful and misleading as well. The economic policy of monetarist restriction was introduced first in England, then in the United States, actually by conservative politicians and parties, as a response to the *Keynes*ian policy that was considered in another sense too 'liberal' that time. Therefore 'monetarist restriction vs. social-democratic type redistribution' is only a political conflict. Concerning the real field of economy, it is not so. To consider Maggie Thatcher or Ronald Reagan 'liberal' from any real aspect of liberalism would be quite an absurd assumption indeed. By this, again, we arrive to the fact that the complex of monetarist restriction is essentially incompatible with any basic vision of liberalism.

Next we have to define, in what sense we use the term 'monetarism'. 'Monetarism' is firstly a well-known concept of economic theory, which has not only appeared in several eras of history, but it even managed to find its proper place not only in the framework of neo-liberal, but of other economic concepts as well. This problem can proceed in several further directions, and now we would mention the 'pope' of the

economic neo-liberalism of the ‘70s *von Hayek* could also raise strong objections against the narrow economic approach of monetarism!

In global context, by monetarism we mean the uniform fundamental complex of today’s political and fiscal order. It entails the international order of both inwards and outwards indebted states, in which the policy of monetarist restriction prevails both internationally and in the framework of the nation state. This is the complex we shall call ‘monetarism’ in the following, independent from the strongly different various views whether the state of indebtedness is only temporary or not. In international political and economic terminology, there is no special term for this extensive ruling *global* economic system. The lack of the proper term speaks for itself. It is an evidence for the fact that even other important actors consider today’s world economy and the system of world politics bound to it ‘normal’. While it cuts back social functions of the state (including several functions that had been *taboo* before), it strengthens the state’s debt-managing forced functions (what is totally anti-liberal), radically redefines politics that had been an intact and most important sphere of society for the fundamental vision of liberalism before.

Monetarism makes – in a functional and system-theoretical sense – a theatre out of the central political environment that should have been the central subsystem from the aspect of political liberalism. It thrusts the whole system of politics on a course of a programmed failure. The other reason why monetarism is not liberalism is that at certain points of the financial system, it makes regulating and conscious (*etatistic*) intervention possible even into the seemingly most spontaneous processes. It is not only against its own ideology, but it even contradicts its own deeper definition as a system of a *free play of free forces*.

Within the framework of Existing Socialism, the indebtedness of the state meant necessarily increasing freedom – but it is no wonder that so many things were considered progressive in the captivity of Existing Socialism. That’s why the economists and politicians representing the policy of indebtedness could win the support of the politically active part of society. It belongs to the negative antecedents that Hungarian financial policy could use every political situation in that one and a half decades as an opportunity to earn more credits. Hungarian financial policy could

manage to take new credits in whatever world political or world economical context, ideological course, or case of emergency. Meanwhile, the Hungarian political class was obviously less resourceful (and what is more important, less successful) at elaborating a concept to liberate the productive powers of society. Therefore, there was a point when the row of credits as a supposed starting point of future constructive economical processes inevitably turned to a destructive phase. But even past the critical point, neither economists, nor politicians could manage to get the economy off the forced course of this vicious circle. Moreover, in the meanwhile, an insightful outsider could not escape the suspicion that neither the political class, nor the opinion-making economists were aware and conscious of the further consequences of fatal debt problems.

Globalization and its actors

Globalization manifests itself *through* society, institutions and individuals, over long and uncertain transitional periods, in which the gained advantages are easy to lose and it is often not clear what would be the next step that makes sense.

But the actors of globalization are often missing and it is shown clearly in comparison with the new specific global functions. The case of missing actors occurs when political or other processes of globalization create new and strong functions, but at the same time, there aren't any equally strong, socially legitimated and responsible actors to fulfil these functions. This starting situation 'distributes the actorial spaces' originally in a wrong way. The empty places and functions of missing actors either remain unrecognized or tricky interest groups push themselves into this vacuum. The basic model is simple: *an interest group pushing into the vacuum can only be called an actor in one specific sense, i.e. that it follows solely its own interests.* To achieve this end, it must shape the political space to some extent, but it does not do it as a legitimate and constructive actor, therefore its activity inevitably implies the destruction of political space.

The actorial aspect in general is a theoretically attractive new component of globalization. Although his term can also be used for the political and social reality of the pre-globalization era, yet globalization opens a new era in the history of this term,

mainly because globalization liberates individual actors from the organizational and original interconnectedness of bigger political and social integrities, mostly *organizations* and it arranges the universe of the actors in a new way. This means that after all, everyone is an actor and this is not just a mere play on words. We are actors both in a theoretical and in a practical sense. Unfortunately, we still identify this new side of globalization rather with the actually existing 'caesaristic' components of the actorial dimension, than with its also actually existing democratic components. Global competence itself also lacks actorial foundation. Neither traditional *forecast*, nor traditional *consensus-making*, nor traditional *administration*, nor any other traditional *institutions* are capable of shaping competence legitimately.

The relation to modernity in a history-philosophical sense is decisive not only from the aspect of potential enemies and enemy images. In a positive sense, it is decisive because *in several important aspects, globalization, which in fact sprung out from the soil of modernity intends to eliminate the so far most important achievements of modernity as well.* It is about the collision of the totalizing, social-democratic type development of the welfare state and its also totalizing, neo-liberal demolishment[2]. For the most typical fundamental characteristic of today's world is not globalization in its pure form, nor integration in its pure form, but globalization or integration qualified by state debt, which is a specific characteristic of all states.

Therefore, on these bases, the sensible consequences of the deeply interdependent relationship of globalization and liberalism/neo-liberalism are getting chrystallized around the issue of the state. Now we can clearly see that the state as a '*buffer*' is a central element of the battlefield of globalization, but of course, only if we consciously insist on the actual achievements of modernity and emancipation[3].

Neo-liberalism has arrived to a great change. After its worldwide victory it remained as the only regulator of globalization on the political-ideological scene. And past the acme of its exclusive hegemony it became identical with the whole of the existing social and economic world order in common political consciousness. It is a not yet achieved high-level realization of the present world order, globalization and rationalization that also amplifies the tendencies that follow from 'bidding farewell' to the myths. If neo-

liberalism is really an outcome of such a height of rationalization in this theoretical framework, it must not pass by the developing new forms of emancipation.

Notes

1 On 31st March 2004, a Bolivian miner blew up himself in front of the Bolivian parliament. The direct cause of his action was that he got no pension, and his argumentation was flawless. He demanded a sum he had gradually paid as taxes for the state of Bolivia during his working decades, and he did it not without any rightful ground.

2 The most important characteristics of the theoretical starting situation created by globalization can be fully examined at this conflict. The demolishment of the welfare state does not basically appear as an economic or political problem in this discourse (although it might still be controversial in this context as well), but as a civilizatory, modern, cultural, and society-building factor. The context of globalization does not erase the validity (Gültigkeit) of the individual subsystems, but it positions new, general and painfully concrete 'global' i.e. general and universal contexts above their rationality.

3 Pointing out these criteria is not an unnecessary theoretical enterprise nowadays. It is namely not included in the expectations concerning morals, society or even good manners that beyond pursuing his own particular interests, one had any duties in order to preserve the achievements of civilization, emancipation, or modernization.

4 Our present inquiry relies upon several former works of us. We are hereby giving the data of some relevant works, so the reader might get sufficient information about the history of certain thesis in more detail.

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András Vág

Environment-Society Interactions and the Effectiveness of Environmental Policies

Executive summary

This study gives a general overview of some visual models of environment and society interactions in association with effectiveness of environmental policymaking. It discusses different definitions of effectiveness of environmental policies, and summarizes state-of-the-art research in effectiveness of environmental policy-making, and provides some conceptual implications. *The study indicates the role of futures fields in the improvement of environmental policy effectiveness.*

A key criterion of effective environmental policy-making is how well regulatory systems achieve their objectives. The publication of the Hampton report (2005) sheds light on another aspect of effective policy-making, notably the reduction of administrative burdens. *This aspect of the reform has received the most attention to date and has resulted in new agendas in research and assessment projects.* For now, it is evident to both policy-makers and scientists that a well planned and managed environmental policy can achieve its goals at low cost and with minimal disruption to the economy.

In spite of the increased interest, environmental policy effectiveness is not a well specified term. The majority of the studies contain neither well specified definition nor maintain effectiveness computations. The most frequently used approach in this context is called ‘policy assessment’ (a.k.a. impact assessment) that either means qualitative evaluations, or denotes discussion of the conclusions drawn from the comparisons of

specific goals (or trends) and factual figures. Hence, the results of policy assessments are indispensable reference points of effective policy-making.

The chain of explanation starts with the presentation of some environment-society interaction models. The main reason of this is the assumption that the better conceptual understanding of environment-society interactions can improve the quality of policy design and leverage the effectiveness of environmental policies. Additionally, the forecasting and foresighting of these interactions can also contribute to the improvement of the quality of policy-making.

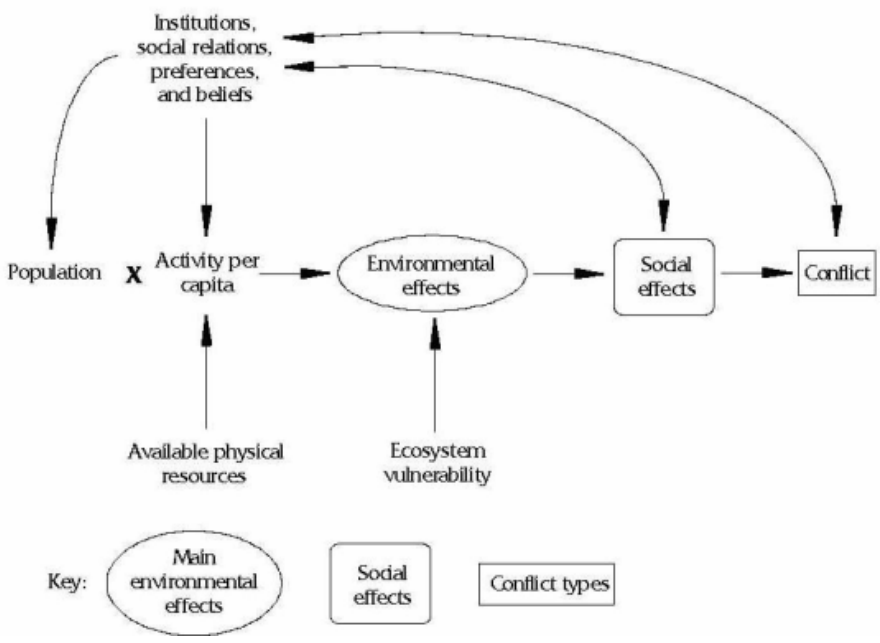
The study continues with the definition of the term ‘efficiency’, continues with ‘policy efficiency’ and ends with ‘environmental policy efficiency’. According to the most common understanding, ‘environmental policy effectiveness’ is the ability to create significant improvement in the quality of the environment. However the notion looks more complicated when trying to quantify it.

Literature giving an overview of the effectiveness of environmental policy has resulted in valuable lessons. It has become evident that *there is a large gap between the requirements set out in official documents and the actual practice of impact assessment.* More information is needed on the effects and effectiveness of different levels and measures. Data limitations are demanding, but not insurmountable. Several methodological tools exist for evaluating effects and supporting policymaking and regulatory processes. These assessments should consider the whole policy process and the coherence of legislation. Effectiveness evaluations contribute to capacity building and shared policy learning. Furthermore, sufficient engagement with regulators and other interested parties, and adhering to strict timelines in order to allow adequate time to implement decision-making is vital. Regulatory actions to promote compliance must take each of these into account. *But even full compliance with a specific rule will not result in Social sciences, the achievement of the objectives if the rule’s underlying design is not appropriate, including futures fields, can contribute to the improvement of environmental policy effectiveness in multiple ways.*

Some models of 'environmental change – socio-economic responses'

This chapter shows some environmental change-society interaction models. *The models, their structure and interlinks help gain better understanding the influential factors and support futures researchers to clarify the potential scenarios.* Six models are presented: 1) Homer-Dixon's 'Environmental Change and Acute Conflict' model, 2) Schwartz's 'Social, economic and political ramification of environmental stress', 3) Barker's 'Integrated Assessment Framework for Climate Change with Adaptation and Mitigation', 4) The IPCC's 'Assessment of Climate Change Impacts', 5) The IPCC's 'Sustainable development and adaptation to climate change' model, and 6) Brauch's 'Climate Change Impacts: Pentagon of Conflict Constellations' model.

Figure1. **Homer-Dixon: Environmental Change and Acute Conflict**

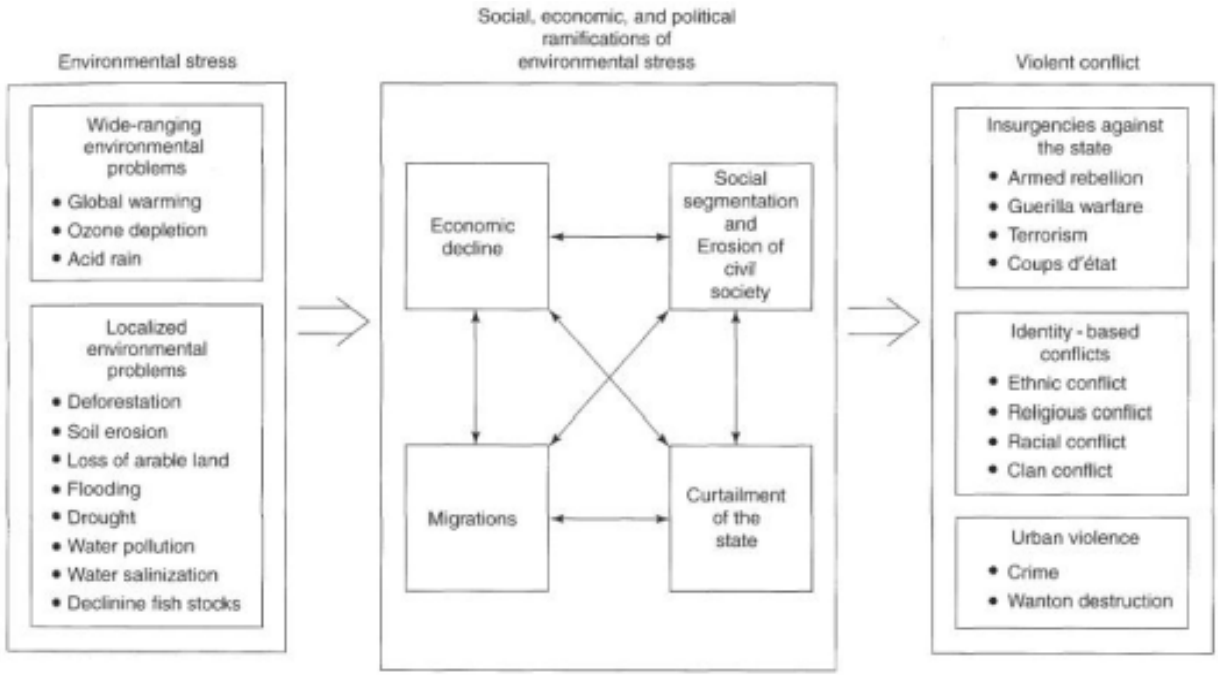


Source: *Homer-Dixon*, 1999

The figure 'suggests that the total effect of human activity on the environment in a particular ecological region is mainly a function of two variables: first, the product of total population in the region and physical activity per capita, and second, the vulnerability of the ecosystem in that region to those particular activities. Activity per

capita, in turn, is a function of available physical resources (which include non renewable resources such as minerals, and renewable resources such as water, forests, and agricultural land) and ideational factors, including institutions, social relations, preferences, and beliefs. The figure also shows that environmental effects may cause social effects that in turn could lead to conflict. For example, the degradation of agricultural land might produce large-scale migration, which could create ethnic conflicts as migratory groups clash with indigenous populations. There are important feedback loops from social effects and conflict to the ideational factors and thence back to activity per capita and population. Thus, ethnic clashes arising from migration could alter the operation of a society's markets and thereby its economic activity.' (*Homer-Dixon*, 1999)

Figure 2. **Schwartz: Social, economic and political ramification of environmental stress**

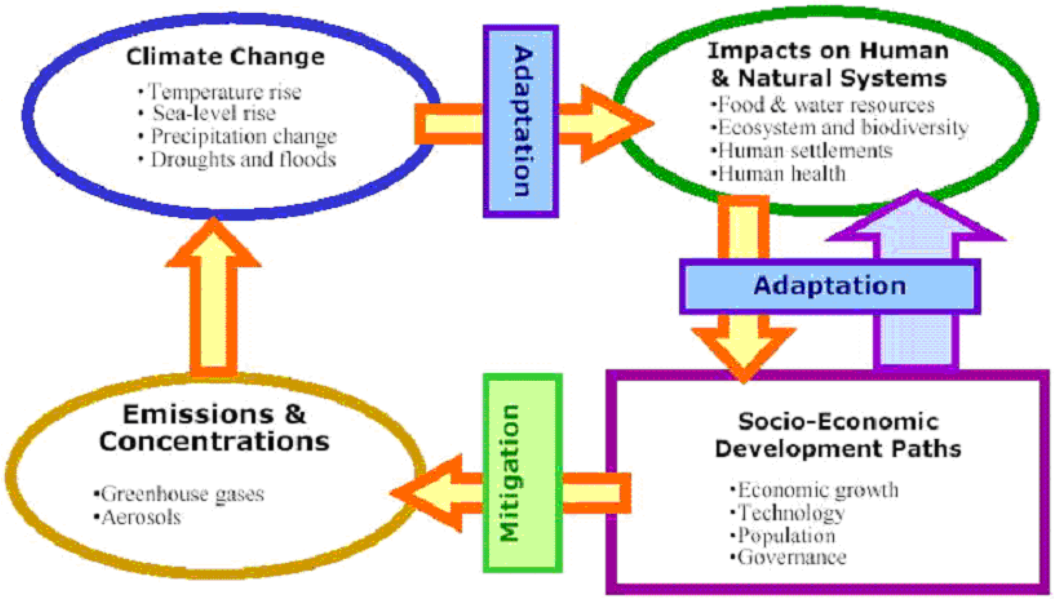


Source: *Schwartz*, 2002, p143

While explaining 'The Roads to Conflict' Schwartz considers population growth to be closely linked with environmental stress. Among the wide-ranging environmental factors he includes ozone depletion and global warming and among the localised ones those environmental factors that affect small areas at different times (desertification, water pollution). He points to 'five pathways to indirect internal conflict that involve

environmental stress: economic decline, migrations, social fragmentation, erosion of civil society and curtailment of the state' (*Schwartz*, 2002, p139).

Figure 3. **Barker: A 'Cause and Effect' Integrated Assessment Framework for Climate Change with Adaptation and Mitigation**



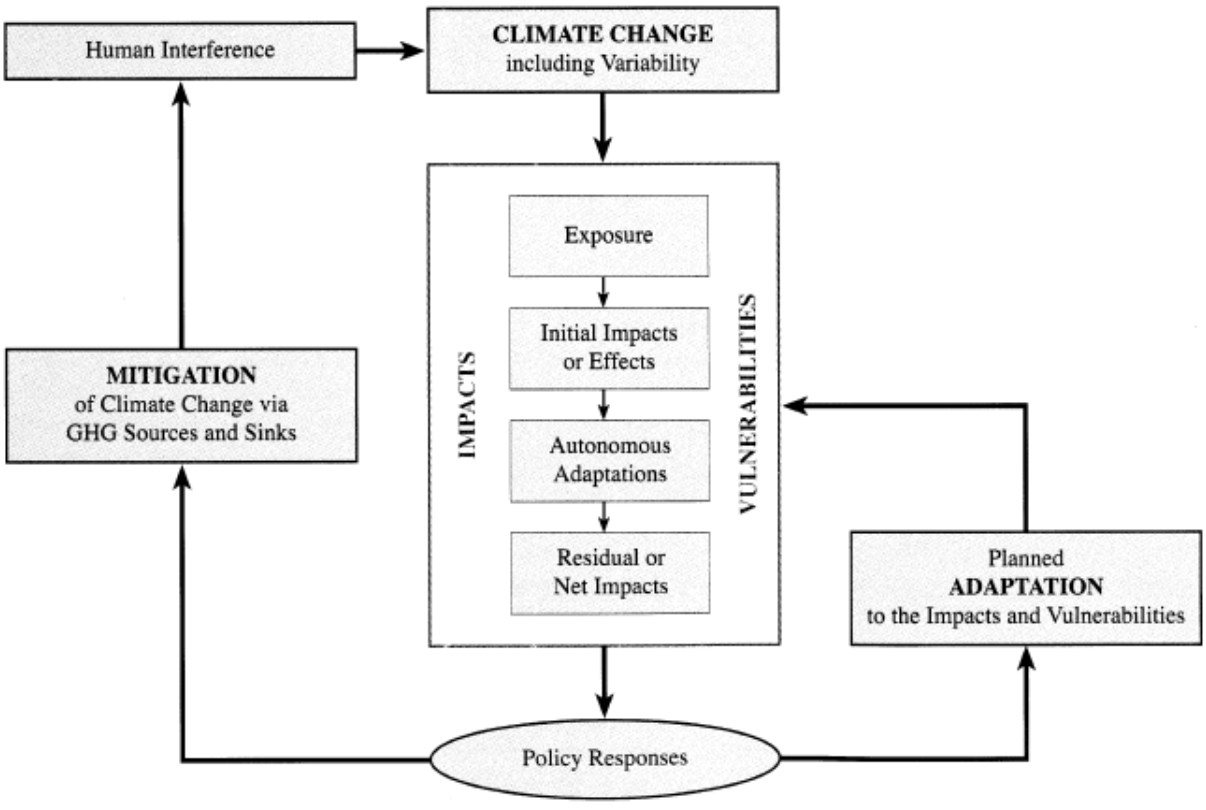
Source: *Barker*, 2001, p9

The above figure shows the linkages between changes in human society and climate change as a set of 'causes and effects' in a driver-pressure-state-response methodology. More formally, it provides a schematic and simplified representation of an integrated assessment framework for considering anthropogenic climate change. The figure shows changes in four domains in the quadrants i.e. (1) human society, i.e. the socio-economic system with development paths described in the SRES (2) atmospheric gases with concentrations of greenhouse gases, aerosols and precursors (3) the climate system undergoing Climate Change as a result of higher concentrations and radiative forcing, and (4) human and natural systems including all plants and animals.

The arrows show a full clockwise cycle of cause and effect between the domains. Each socio-economic development path, including development of the industrialized countries, has driving forces that can be grouped into the areas of population, economic growth, technology and governance. These driving forces give rise to emissions of

greenhouse gases, aerosols and precursors, with CO2 being the most important. The emissions accumulate and interact in the atmosphere as concentrations and disturb the natural balances, depending on physical processes such as solar radiation, cloud formation and rainfall. The aerosols also give rise to air pollution, e.g. acid rain, that damage human and the natural systems (not shown). The long-term effect is to change the global climate system (higher radiative forcing i.e. the enhanced greenhouse effect) with temperature rise leading to sea level rise and more global precipitation change. These climate changes, in turn, have impacts on natural systems through more storms, floods, droughts. There is a possibility of some feedback between the changes in these systems and the climate, such as albedo effects from changing land use, and other, perhaps larger interactions between the systems and atmospheric emissions, e.g. effects of changes in land use.

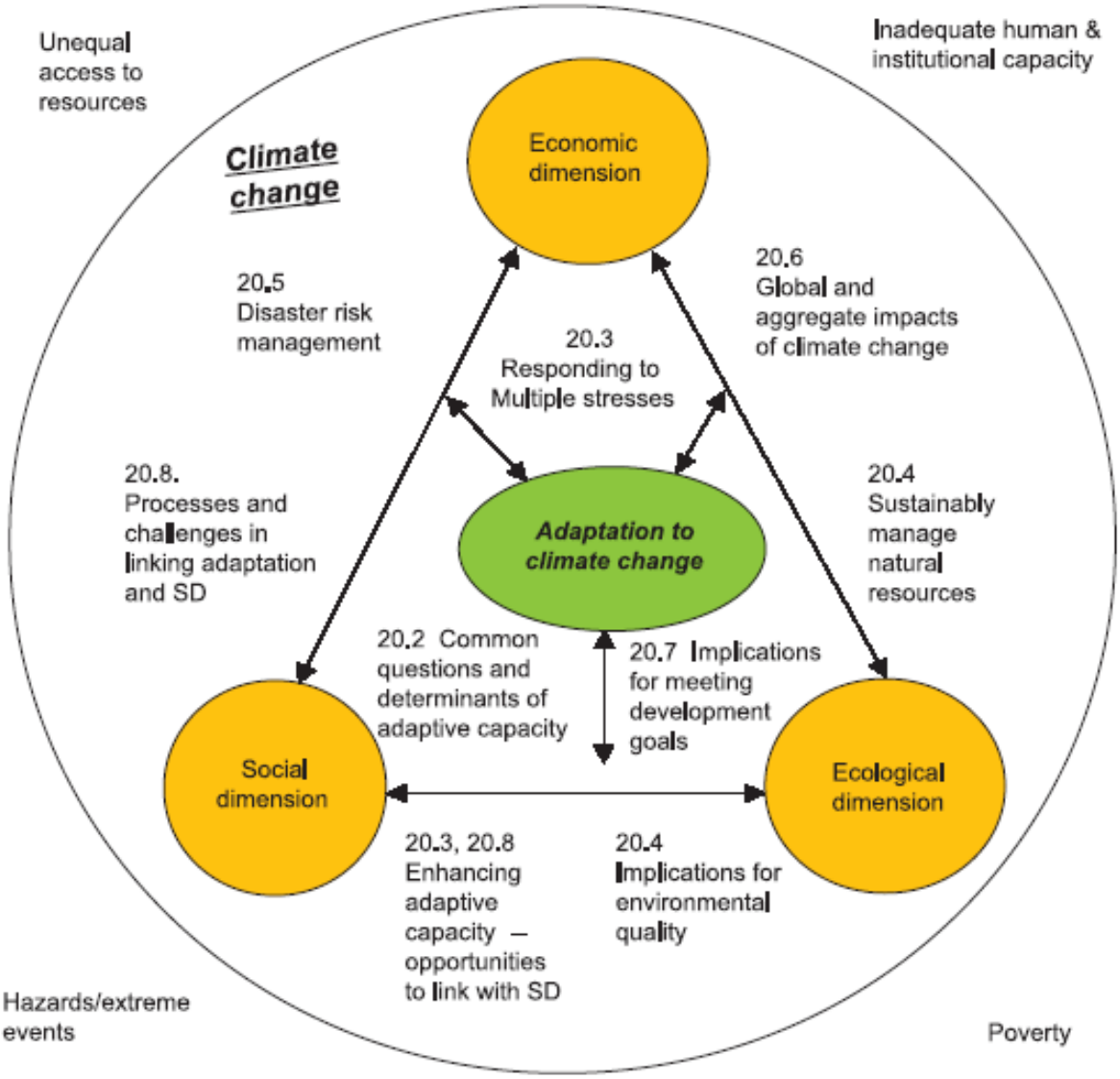
Figure 4. **IPCC: Assessment of Climate Change Impacts**



Source: *Smit et al.* 1999, quoted by IPCC 2001 p90.

The IPCC's WG II 's model clearly distinguishes mitigation and adaptation activities and the role of policy-making.

Figure 5. **IPCC: Sustainable development and adaptation to climate change**

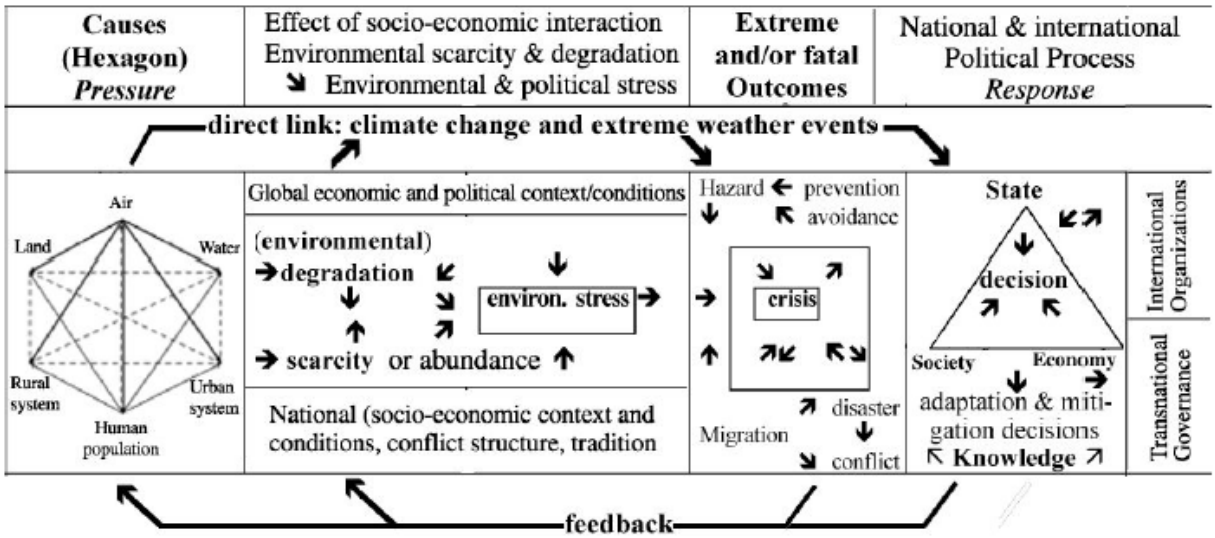


Source: *IPCC*, 2007, p815

The 'Sustainable development and adaptation to climate change' figure locates the key topics schematically in the context of the three pillars of sustainable development. Topics shown in the centre of the triangle (the 'three-legged stool'of sustainable development) are linked with all three pillars. Other topics, placed outside the triangle, are located closer to one leg or another. The arrows leading from the centre indicate that adaptation to climate change can influence the processes that join the pillars rather than the individual pillars themselves. For example, the technical and economic aspects of

renewable resource management could illustrate efforts to support sustainable development by working with the economy-ecology connection – all nested within a decision space of other global development pressures, including poverty. (*IPCC*, 2007)

Figure 6. **Brauch: Causes and Outcomes of Environmental Stress and Potential Outcomes**



Source: *Brauch*, 2003, p126

The complex interaction between processes in the ecosphere and anthroposphere are visualised in a 'survival hexagon' of three resource challenges: air (climate change), land (soil, ecosystem degradation), and water (scarcity, degradation, floods) and the following three social challenges: human population (growth, changes of its value systems), urban systems (services, industries, pollution, health) and rural systems (on the left side of the chart). These six factors interact in different ways and contribute to environmental scarcity of soil, water and food that in turn intensify environmental degradation and result, taking the specific national and international context into account, in environmental stress that may lead to different outcomes.

These may be resolved, prevented or avoided primarily by national political decisions and supported in some cases by diplomatic efforts. The political process on the inter- and transnational level may contribute to the following outcomes: 1) a successful

resolution by cooperation, or in the worst case, possibly also to, 2) conflict at the internal or international level, and 3) increased human mobility.

Depending on the system of rule and on the level of economic development, the interaction between the state, the economy, and the society differs, as will the role of knowledge due to scientific innovation to enhance the national coping capacities for adaptation and mitigation. (*Brauch*, 2005)

The above models visualize some of the interactions between environmental change and socio-economic responses. There are no widely accepted concepts to describe and to forecast these interactions. However, environmental policy-makers definitely need to better understand the environment-society interactions and to foresee the effects of planned policy-interventions (mainly in the phase of 'ex-ante analysis' of policy implementation). *The models of 'environmental change – socio-economic responses' not only help to understand these interactions but may contribute to the development of potential future scenarios, and to the underlying of future policy objectives.*

The model based scenarios can be used by foresight developers to facilitate the consensus formation process with stakeholders. The methods of participative foresight can support the learning-by-doing activities and the fitting of environmental policy design to socio-economic reality.

Policy effectiveness

Policy effectiveness in general

As Anthony Giddens, the well-known sociologist, suggests: 'The state is back. We will need active industrial policy and planning, in respect to economic institutions but for climate change and energy policy as well.' (*Giddens*, 2009, p1) Parallel to this '*return to planning' concept*, the interest in powerful and financially affordable ways to improve companies' and individuals' compliance is steadily increasing. But what does 'return to planning' mean in the context of climate change? 'It means taking a long-term view of things, with a time horizon stretching over three decades and more into the future.' If climate change represents, as the Stern report says, 'the biggest example of

market failure ever', it is largely because markets have no such view or vision of the future. Market forces can certainly be used to affect long-term processes – as happens in a routine way with pensions or insurance for instance – but they always need a regulatory framework, usually provided by the state, to do so.' (*Giddens,* 2008 p9) *The importance of planning gained recently implies the need that policies and regulatory measures must serve both long-term and short term goals effectively. The increasing importance of planning strengthen the traditional, plan-supporting role of futures research in shaping the long-term objectives.*

Definitions associated with policy effectiveness

Policy effectiveness is not a well clarified term. The majority of the studies contain neither well specified definition, nor maintain effectiveness computations. The most frequently used approach in this context is called *'policy assessment'* (a.k.a. impact assessment) that either means qualitative evaluations, or denotes discussion of the conclusions drawn from the comparisons of specific goals (or trends) and factual figures. Hence, *policy assessments are indispensable condition of effective regulation*.

It is necessary to clarify the definitions associated with policy effectiveness because *the approach of the science and that of the policies differs in many cases, and the altering approaches sometimes produce confusion.* It seems reasonable to make distinction between the terms 'effectiveness' and 'efficiency' since both of them are used as key-terms. Effectiveness is the extent to which an activity fulfils its intended purpose or function. Effectiveness is a measure of the ability of a program, project or task to produce a specific desired effect or result that can be qualitatively measured. 'Effectiveness of a measure' is a judgement about whether or not the expected objectives and targets of the policy measure have been achieved. This requires comparing the effects of the measure with its intended objectives. (*Guedes Vaz et al.*, 2001, p9) Efficiency is the extent to which an activity achieves its goal whilst minimising resource usage. Efficiency can be measured by the volume of output achieved for the input used and, hence, is closely related to productivity. In harmony with many other reports, OECD mentions the two key terms together in its recent study: 'It is also increasingly possible to reach environmental goals by implementing *effective*

and *efficient* market-based instruments' (*OECD,* 2006, p95). Evidently, if the outcome of a policy is far from the expected target, than this policy is ineffective.

These definitions imply the hypothesis that it is easier to quantify and use one dimensional assessments and neglect the second (or more) aspect(s). In the case of effectiveness this dimension is the 'extent to which an activity fulfils its intended purpose or function' and at the same time cost aspects are neglected.

Contrary to the above efficiency definitions always contain the cost element either by maximizing the achievements while costs are fixed, or by minimizing the costs while expected output is fixed. *The policy-makers role is to decide which combination of 'level of fulfilment' and 'costs' would be preferred.*

In the practice it is extremely difficult or even impossible to perfectly quantify the 'level of fulfilment' and to consider all 'costs'. But there are approximations. A widely used methodology to compare outcomes (effects) and the associated expenditures (costs) of two or more courses of action is the so-called *cost-effectiveness* analysis. In a pioneering report the European Environmental Agency defines the *cost-effectiveness of a measure* as: 'a comparison of the effects of a set of measures with the costs of implementing them. A more cost-effective measure will have achieved greater results for less money' (*Guedes Vaz et al.*, 2001, p9).

Regarding the above uncertainties, it seems necessary to use the term *'effectiveness study'* (a.k.a. effectiveness analysis, effectiveness report, etc.) in two different ways. The *first* denotes a pure qualitative or quantitative comparison of the 'intended purpose' and the 'extent to which it is fulfilled'. The *second* reflects on the studies in which (besides the above first meaning) the term efficiency, cost-effectiveness, process effectiveness, etc. are not clearly used. Of course, the latter studies are *not coherent* with the clearly defined terms discussed above, but many publications use it.

After clarifying what effectiveness means, we need to define 'policy effectiveness' and, first of all, to discover the potential differences between its assessments. Concepts of policy effectiveness can be distinguished, among others, by their 'scope'. 'Scope' of regulation, in this context, reflects to the relevant activities of and impacts on all

stakeholders, and to the associated actions, processes, side-effects, policies and measures considered when assessing the particular effectiveness of a regulation.

When discussing '*policy effectiveness'*, the most widely used concept considers the 'implementation' stage, the most important part of the policy cycle. *This basic understanding can be expanded in three incremental steps*:

- the *first* expansion step considers all other stages of the policy cycle;
- the *second* policy effectiveness approach analyses the activities of all stakeholders, including the policy organization, the financial burdens on businesses, the undesirable side-effects, and the specific cost items associated with the regulation, etc.
- the *third* considers other policies that may interact with the assessed policy.

Hence the 'scope' of all assessments of policy effectiveness has far-reaching consequences. Most of the policy effectiveness concepts and studies use the basic concept, which, as indicated above, focuses on the implementation phase of the policy cycle. *This concept also implies that, in most cases, one policy target and only the administrative costs are considered.*

It is essential to make clear in each assessment of policy effectiveness that whose (administrative) costs are being assessed. Since the release of the Hampton Review emphasis has been put on the reduction of the administrative burdens of regulation on *businesses.* However the administrative burdens on the *regulatory organizations* have also high relevance. The position of the Better Regulation Task Force is clear in this context when it states: 'Every government department should use a standardised approach to measure the existing administrative burden which it imposes on business through its regulatory activities. The measurement should include all the administrative obligations imposed by central government departments and regulatory agencies under both national and European legislation.' (*Better Regulation Task Force*, 2005, p4) The UK Government's methodology for measuring climate change costs and benefits (titled: '*Greenhouse Gas Policy Evaluation and Appraisal in Government Departments'*) can serve as a starting point for assessments of environmental policy effectiveness. (*Department of Energy and Climate Change*, 2008).

The wider scope concept is shared by many organizations and scientists. For example the opinion of the European Environment Agency is clear in this context: 'for environment policy to deliver effective results, the institutional setup can be as important as the design of the policy itself.' (*EEA,* 2005, p2) Rousseau and Proost state that 'In order to compare different environmental policy instruments in a more realistic way, it is useful to look at the different stages in the regulatory process. The comparison of environmental policy instruments should take these various regulatory stages into account.' (*Rousseau, Proost,* 2005, p340)

'Environmental policy effectiveness' is the application of the concepts of 'policy effectiveness' in the area of environmental issues. Both the conceptual and empirical assessments of environmental policy effectiveness (and cost-effectiveness) should start with the declaration of the considered objectives and costs of the given environmental regulation. In practice these are often unclear.

An environmental policy may have at least one out of three types of *aims:* 1. *welfare maximization,* 2. *achieving environmental targets,* and 3. *behaviour modification*. The *costs* of environmental policies are much more difficult to categorize. A frequently used cost-type is the so called '*policy implementation cost'* which may contain the financial burdens on both the companies and regulatory organizations. (Cost categories may consist of very specific type of costs too, like '*cost of non-compliance'*, '*costs of inactivity'* and '*negative costs'*.) Effectiveness of environmental regulation can be assessed along any of the combinations of the above, for example by analyzing the *achievements of environmental targets* and the linked *implementation costs*.

When looking for *the most effective environmental regulation* it is not evident how to select the appropriate constellation of aims (outcomes) and cost alternatives. In practice, there are a (theoretically infinite) number of optimal or close-to-optimal solutions. The reason for this abundance is the fact that *most of the environment-related factors (e.g. the interests of the future generations, the economic values of specific ecosystem services) can not be converted into economic terms directly; consequently their utilities are usually assessed differently.* This uncertainty is one reason (among others) why politicians and policy-makers assess environmental policies in different ways.

A short historical overview of environmental policy effectiveness research

Most of the policy reports and scientific studies deal with the theoretical considerations of environmental policy effectiveness. For now we are well equipped with 'general concepts' and 'overall expectations'. But parallel to this, a surprisingly *low number of scientific studies deal with the assessment of effectiveness of specific environmental policy implementation processes.* In a recent study the European Environment Agency admits that 'Very few studies have assessed the effectiveness of adaptation measures'. (*EEA*, 2008, p16)

The policy analysis 'movement' from the end of 1960s erupted into American political life. Their legacies are still evident in social science, in administrative institutions, and practices at all levels of government. Social scientists and the mediating contributions of policy analysts are vigorously contested, raising issues concerning the future of policy analysis training and practice. (*Lynn*, 1999)

The first steps in the domain of environmental policy effectiveness research were linked to environmental taxation. Since the 'Environment and Economics' Conference in 1984 the OECD has encouraged the use of economic instruments in environmental policy. The Conference emphasized that economic instruments stimulate innovation in environmental technologies and promote efficiency. From that time OECD has been publishing a series of important reports dealing with environmental policies, policy evaluations and environmental effectiveness. For example in 1993 OECD published a report on '*Improving Regulatory Compliance: Strategies and Practical Applications in OECD Countries'* that was a landmark in the OECD's discussion of the issue. (*Braithwaite*, 1993) The report gave an overview of emerging issues for regulatory compliance. It categorized the level of (non-) compliance into three types: the degree to which the target group (1) knows of and comprehends the rules, (2) is willing to comply, and (3) is able to comply with the rules.

One of the main drivers of environmental regulation research and environmental policy analysis, at global level, is the European Environment Agency (EEA). EEA started publishing its environmental policy effectiveness related reports in the middle of the 1990s. The first report, titled '*Environmental taxes – implementation and environmental*

effectiveness', provides an overview of the main issues involved in environmental taxes, with a particular focus on their environmental effectiveness and on the political barriers to their implementation (*EEA*, 1996). The first experiences, extended with the results of later studies have been summarized in a recent report, published ten years after the pioneering study (*EEA*, 2006).

The next relevant publication of the EEA (published in 2000) states that tax rates in the EU Member states are insufficient for all internalisation of external costs, for giving the correct signals to the market, and for establishing a more efficient and equitable fiscal system…and that insufficient eco-taxation means unfair fiscality and impedes progress in sustainability in the market economy. As the Executive Director of the EEA stated 'Environmental taxes are absent at the EU level' (*EEA*, 2000, p5) which indicated the size of the problem European countries had to face.

In 2001 European Environment Agency (EEA) published a report called: '*Reporting on environmental measures: are we being effective?'* (*Guedes-Vaz et al.,* 2001) The report was the first comprehensive conceptual overview of the problem published by the EEA. *It confirms the general lack of scientific and policy level knowledge about the effectiveness of past policies for most areas.* The report sets out an agenda for the assessments of environmental policy effectiveness, conceptual approaches, and methodological frameworks.

In 2006 the OECD Competition Committee held a roundtable discussion and published the results under the title: '*Environmental Regulation and Competition'* (*OECD,* 2006). The participants concluded that environment and market are two of the highest priority policies. Environmental programmes and policies should be designed to achieve their objectives without unnecessary market restrictions. Commercial bodies should help environmental policy-makers to find alternatives to achieve environmental goals that restrict competition as little as possible.

In 2007 OECD published a report, titled '*Instrument Mixes for Environmental Policy'* in which they addressed the impacts on environmental effectiveness and economic efficiency of using an 'instrument mix', rather than a single instrument. The report is an important step in the domain of the assessment of more effective solutions of

environmental regulation (*OECD,* 2007a). The OECD Environmental Performance Review Programme, whereby all OECD countries are engaged in reviewing each others' progress in achieving their environmental policy objectives. The analysis and recommendations are supported by a broad range of economic and environmental data.

The next study, in which EEA has been engaged in evaluating policy effectiveness, was published in 2008, titled '*Effectiveness of environmental taxes and charges for managing sand, gravel and rock extraction'* (*EEA,* 2008). Although the report focussed on some very specific business sectors and on one type of policy instrument (according to the authors) some of the lessons learnt can be generalized. The end result of the lessons learnt is that *differences between countries can be considerable*. Even the different segments or regions of the same country may show different patterns (e.g. in compliance). *This is one reason why policy-makers must be very cautious in adopting best practice and evidence from different cultures and economies.*

Another branch of research of environmental policy effectiveness is within the frames of European research projects and networks. The aims of the '*Competitiveness Effects of Environmental Tax Reforms'* (*COMETR*) project are (among others) to outline and clarify the competitiveness debate, to review the experience of environmental tax reforms in EU member states, with particular emphasis on carbon-energy taxation; to undertake a macro-economic analysis of the competitiveness effects of green tax reforms for individual member states as well as for the EU as a whole; and to review mitigation experiences and provide policy advice on possible strategies to improve efficient mitigation measures (http://www2.dmu.dk/cometr/). The aims of the '*European Network for Better Regulation'* (ENBR) project is to set up and operate a pan-European network aimed at improving and disseminating the current knowledge of regulatory processes as well as the degree and mode of implementation of impact assessment procedures in EU member states. (www.enbr.org)

Scientists have also expressed their views about the effectiveness of environmental regulation. In 1997 Bridget M. Hutter published a pioneering book titled '*Compliance: Regulation and Environment'* (*Hutter,* 1997). The author combines and analyses a broad range of factors which influence environmental regulation. The author emphasises *that the concept of compliance and the expected result of regulatory efforts are central to*

policy-makers. Hutter analyses the notion of compliance in two areas of our everyday lives, occupational health and safety and environment.

Another book worth mentioning is Neil Gunningham and Sinclair D's *'Leaders and Laggards: Next Generation Environmental Regulation'* (*Gunningham, Sinclair,* 2002) published in 2002. The authors argue that there is an inherent uncertainty in the assessment of environmental regulation tools such as economic instruments and voluntary agreements. They state that agencies struggle with a lack of information about the details of regulatory measures, e.g. of what works and what doesn't. *The need to improve the effectiveness and to harness the resources of both government and non-government stakeholders are critical to improving environmental quality.* The book addresses these problems by identifying innovative regulatory best practices in a number of specific cases, evaluating empirically the effectiveness of regulatory reform and providing policy advice.

A recent book of Anthony Giddens *'The Politics of Climate Change. Cambridge'*, (2008) highlights the importance of the state policies in the fight against climate change. He argues that *leaders must introduce long-term policies and encourage the shift towards long-term thinking, and urges large scale changes.* Giddens also emphasizes that the state must keep climate change at the top of the political agenda, must intervene to enforce 'the polluter pays' principle and counter business interests which seek to block climate change initiatives.

Conclusions

This study gives a general overview of the environmental change-society interactions in association with effectiveness of environmental policy-making. It concludes that *environmental change-policy interaction models can help to reduce uncertainties, to improve effectiveness, and can provide direct support to policymakers and policy advisors by using the methods of futures research, futures studies and foresight.*

Sciences can support policy-making from problem grabbing, through different kinds of data collection and analysis, to counselling and in some cases to lobbying. *The main policy-related contributions model-based futures sciences and foresight can provide*:

- support of policy-making in all stages of the policy cycle,
- the study of organizational factors of policy success,
- the research of the wider socio-economic and cultural determinants of policy effectiveness,
- the improvement of social acceptance of policy,
- theory development to solve particular regulatory problems, and
- formulating proposals for both general policies and specific regulations.

The majority of the social science based policy assessments focus only on one stage of the whole policy cycle: the ex-post analysis of the implementation phase. But if the research question is 'general policy effectiveness' then the analysis of the organizational and the wider socio-economic determinants of policy success are inevitable.

Most of the scientific activities are strung together around the stages of the so-called 'policy cycle'. All stages of the policy-cycle, from issue identification, via measure implementation, to policy measure effectiveness assessment, should be researched and supported by the sciences, including futures fields.

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Péter Alács

Practice-Orientation and Scientific Approaches: Methodological Underpinnings of Foresight

The methodological construction of foresight

While foresight became a vogue word for some successful participatory, future orientated activities, the need for abstract definitions or theoretical underpinnings have arisen to improve efficiency. Defining foresight would certainly be easier, if foresight could be included into a special category of practice, or if foresight fell under some of the major categories of academic activities. Indeed, some of the futurists regard foresight as a practice, others would rather consider it as science. Practice orientated foresight approaches (*Horton*, 1999) focus mainly on strategy building, and usually confines its scope to a specific field of practice like technology or regional development. Their objective is to aggregate stakeholder's opinions and experts' knowledge about a specific field to support executive decisions. Scientific orientated foresight approaches (*Slaughter*, 2003) derive from future studies and social sciences. Here foresight is distinguished from other categories of futures studies by the application of participatory methods and the shifting of focus from an objective notion of future to the subjective interpretations of the future ('future in the present'). In spite of the many similarities, the two kinds of approaches fundamentally differ. The centre of differences lies in the emphasis on the achievement of a consensus or the exploration of information about the future. Practice orientated approaches need a kind of consensus among stakeholders to ground strategic plans and find pure autotelic exploration. Scientific approaches on the other hand refuse to seek consensus, because of the presumed distortion in opinions within the process, and with it, the loss of objectivity.

The main differences between these two kinds of approaches to foresight explain the limitation of its application. Consensus distorts information and simple gathering fails to meet the needs of decision support. In this paper we develop a more comprehensive notion of foresight that involves both kinds of approaches. Realizing that foresight cannot be definitely interpreted as a kind of practice and cannot be efficiently applied as a scientific category, we reject to approach the notion of foresight from the application point of view. Foresight by its special nature should have a special place in our way of thinking; therefore *we interpret foresight as an intellectual activity*. This differs from the practice orientated approach in having no definite output and so no measure of efficiency. Indeed this also differs from a scientifically orientated approach, because the notion of foresight we wish to approach will never have testable and objective statements. We consider foresight as an activity consisting of several methods that are scientifically proven and applied carefully for special purposes. Thus, foresight is rather a collection of methods and know-how-s, than a practical or scientific solution for a given problem. Its efficiency is determined by its methods, and its applicability the way of usage of the methods. Therefore *we call this approach the methodological construction of foresight*. While this construction is based on the special usage of scientific methods, first we consider the special nature of these methods and set up a three-level categorization of the theoretical advances in science. We will show that this three-level categorization can be used to construct foresight by reverting the order of levels. How foresight applies scientific methods can be considered by discussing the questions of complexity, uncertainty and time in relation to the different levels.

The ladder of theoretical advance

The three-level approach to clarify the foresight process is inspired by the three-level approach of theoretical advances in science, the so called ladder of theoretical advances (*Dopfer*, 2006):

- working with aggragates: discovering phenomenon,
- looking behind aggragates: discovering the structures behind the studied phenomenon
- defining the dynamics: discovering how the system works, understanding the phenomenon.

In science, the phenomenon is discovered and described in the first stage. Here a common agreement about the definition of the phenomenon is necessary. In natural sciences usually the agreement is a controlled experiment that could be repeated and objectively measured, and therefore can be generally accepted. In social sciences there is no such a clear way to define a phenomenon, but this does not imply that an agreement could not be achieved. This level also includes a basic study of the phenomenon to the extent of its identification and its differentiation with regard to other phenomena. We should realize that this level bridges the subjective state of mind and the collective knowledge about the phenomenon. This means that *we meet objective aggregates and also subjective narratives in methodology on this level*.

The Phenomenon is specified in detail in the second stage. This means an exhaustive study of the phenomenon and its relations to other phenomena. If the studied phenomenon is too complex to understand at first glance, different dimensions, projections or confinements are studied in parallel that by the nature of the phenomenon or because of the limits of our mental capacity may not necessarily be part of a single level.

Rules, relationships between specified elements and time are revealed in the final stage, the dynamics of the system is defined. This stage represents the extent to which different segments of parallel studies could be joined. This level is not necessarily unique in respect to a given phenomenon, but under some well chosen constrains we may regard the level as unique, since it maximizes its scope of understanding.

The three stages of this ladder are also referred to, as the roughness or the complexity of its variables as macro-, micro- and meso-level. Aggregates are considered macro variables, because these represent information compression or integration in respect to a special target or to a certain constrain. This is needed to purify information in order to find the relationship between the variables and subjective notions, ideas about the phenomenon. Detailed studies are conducted in the second stage, where information is present in its smallest, elementary form. Between macro and micro, the final understanding of the phenomenon is attained at the meso-level. We should notice that several inter-levels could be defined between the micro- and macro-level. As we move from the micro- to the macro-level through aggregation we may identify less and less

variables, less and less notions. This certainly helps to identify or take to the phenomenon, but does not necessarily help to understand it: through aggregation important dynamical relationships could be hidden and even lost. The dynamical completeness is revealed at the macro-level, but the usual segregation of this level prevents a comprehensive understanding. Thus, *meso-level is defined where complexity is wrapped, but the dynamical diversity is still preserved. We see that the objective of science is the meso-level, because this level incorporates the most understanding of the phenomenon* (*Alács, 2006).*

The three levels of foresight activity

Foresight is not, however science. *We consider foresight not as an activity to predict the future (which would certainly be a scientific activity), but an activity, which seeks the right decisions today for a better future.* Foresight just aims to provide 'useful' conclusions for the future for any stakeholder or decision maker. A reasonable process of foresight activity should therefore consist of the following three steps:

- Meso-level: assessing available knowledge. Identifying the seeds of change.
- Micro-level: studying knowledge in detail, how it is distributed among stakeholders. Determining the key dimensions of desirable futures.
- Macro-level: constructing a general view that helps to deduce the rules in relation to specific situations.

Knowledge should be identified as a basis for foresight activity at the first stage. This should also include state of the art of scientific achievements that is meso-level knowledge. Also experts' opinion is considered here as meso-level knowledge. Unlike in science in case of foresight activity, the meso-level consists of several types of information. This knowledge should be studied involving stakeholders at the second stage. Including scientific results, at the micro-level which in itself is of great help does not however make the micro-level of foresight superfluous. Here the elements of possible futures are present and using these elements the several dimensions and factors of desirable futures must be considered, that is choosing the way of description of desirable future. These logical operations are constructed in one aggregated view at the final stage. These operations are in accordance with the chosen direction of describing

the future at the second stage. In science the macro-level bridges our subjective ideas with common agreement about the studied phenomenon. In foresight the direction is just the opposite. The macro level of foresight represents the individual and common efforts of integrating micro information according to the chosen dimensions, creating principles to ease decision making. Foresight is not necessarily an organized activity; it is deeply influenced by human nature. This kind of activity is duly resigned to psychology. Excluding beliefs from foresight activity does not necessarily mean that we prevented the application of activity from expanding the influence of certain interests. This may be achieved by

- preventing the overlap of scientific results at the first stage as an input of the activity,
- the wide involvement of stakeholders at the second stage to determine key factors for a description of the desirable future (Note that stakeholders should agree by consensus only about key factors and not about the desirable future!) and
- developing the manner in which these key factors can be individually integrated into the world-view of every single stakeholder at the third stage, to ease decision making in every possible future situation.

Foresight and Information Theory

In terms of Information Theory the three-level-approach can be interpreted as the creation of syntax, context and semiotics of foresight related information. The syntax of foresight information is defined at the meso-level. This means that dynamics, trends, prediction, forecasts or seeds of change are not discovered by foresight but only realized and coded for further process. Meso-level does not stand for purely scientific, but for purely dynamical. This means rather the coding of experienced dynamics by stakeholders, more so than the scientifically understood part of dynamics, although the wider usage of the latter would be favourable. *The syntax of foresight relates to the gathered meso-level structures that define the 'grammar' for the later levels.* Stakeholders at the micro-level learn about the regime of possible futures. During this encounter they should decide about the key factors of their desirable future and they should come to a consensus about these factors. *Consensus enables the creation of a common context with regard to foresight information.* The context will be defined through one or more emerging meso-level structures based on the chosen micro-level

factors of the desired future. Macro-level information focuses on the reasons for change, instead of the change in its dynamical sense. As a single stakeholder does not necessarily realize all the possible reasons for change and what change has actually emerged from, hence reasons should be communicated in a special chosen manner. The semiotics of foresight information is defined at the macro-level, but the meaning, the point of view could be slightly different for every stakeholder. *The transfer from the context to the semiotics should be personalizing rather than simplifying, principle-focused rather than moralizing.*

Special questions of methodology

We have chosen three main attributes within the methodology used, to further clarify the foresight process: complexity, uncertainty, and time. Note that these attributes should be discussed in detail when specifying the methods to apply in the foresight process. The study of complexity determines the manner of information processing. The study of uncertainty determines generality and flexibility. Time determines the level to which the method is best suited: qualitative and quantitative methods for instance. Both qualitative and quantitative methods are used to assess knowledge at the meso-level. These two types of knowledge are not integrated at the micro-level, instead they are split or factored. Integration is possible at the macro-level by qualitative tools.

Complexity

Complexity determines the manner of connection between levels. We distinguish two kinds of complexities methodologically (*Alács*, 2006):

- *the top-down approach of complexity* means that a given goal could be achieved in several similar ways that makes a mathematical optimization problem to have several equal solutions;
- *the bottom-up approach of complexity* means that the special manner of interaction among the elements makes the system as a whole work in a strange way, a new phenomenon emerges that cannot be explained by the characteristics of separated elements.

We experience both types of complexities in the foresight procedure. As moving from the meso-level to the micro-level, we see the top-down approach of complexity. Several meso-levels are created in the first stage of the foresight process. In the second stage however, we need only a comprehensive set of meso-level information. This means that different meso-levels are compared, extended and optimized. We experience the bottom-up approach while moving from the micro-level to the macro-level. Choosing the dimensions of key factors means emergence studies and the application of methods that facilitate this emergence.

Uncertainty

Uncertainty does not only represent lack of knowledge in the process of foresight, but also the lack of trust and reliability. A successful creation in the first stage of foresight should, however involve only the former, because at this level, the different meso-levels are dealt with independently. Approaching the consensus about key future factors at the micro-level, at least develops a weak connection between the meso-levels. Here uncertainty is utilized to enable flexibility for the development of these connections. Uncertainty arises at the macro-level with the appearance of distributed knowledge. The efficiency of the foresight process cannot be directly measured, failures of the methods or misinterpretations can only be revealed later.

Time

Time can be interpreted in many different ways. The physical approach is well developed especially after the elaboration of General Relativity, however interpretations beside the most accepted astrological interpretation have also emerged like in philosophy, economics or in the social sciences (*Sorokin, Merton*, 1937, *Lewis, Wigert*, 1981).

The common line of thought in every interpretation of time is that the notion of time cannot be defined or understood without the understanding of dynamics: reasons and consequences make the states of the system follow a specific order or law. Therefore after defining the states of the system, a measure of this order, time, is usually defined. In this way the relationship between time and the evolution of the system is possible, in

our terms the meso-level is created. Forecasts must construct time first before further studying the system. E.g. the notion of the short/long term is sometimes more convenient, than the choice of astrological time. Note that this can highly differ depending on the field it is used in: the long term with regard to inflation is still far shorter, than the short term in relation to demographics. Foresight activity does not construct time. The objectives of foresight are timeless (not to be confused with eternal) and therefore at each level of the ladder a certain sublimation is applied to the notions we use.

The meso-level is the level, which concentrates on the interaction between the elements, all information can be unified by comprehensive dynamics. Dynamics is the valid unifying order at this level, that defines time, and so time is unique. At least this must hold to each stakeholder, but does not necessarily mean that, on this basis, the foresight process as a unique time would exist (consider the cases of small, innovative and dynamic firms with government bureaucracy).

The objective of the micro-level is informational enrichment, concentrating on the elements. At the micro-level informational enrichment of the system overloads the dynamical logical order, thus at this level several projection of micro information as well as several interpretations of time, not only co-exist but also interact with each other in a comprehensive conversation.

The macro-level concentrates on the phenomenon, the points of views or an information axis in a descriptive way. Its historical perspective however is not to be confused with its relation to time. Revealing the effects, clarifying the phenomenon, it is targeting the stable and so timeless properties. The goal here is to find the coding, in which we can talk about the system in order to understand it. *This coding must therefore be stable, in other words the macro-level is timeless.*

Modeling Futures Studies

The term Modeling Futures Studies (MFS) is used for the novel approach to study and understand the three-level methodological construction of foresight (*Alács*, 2006). The basic need for the creation of MFS was the incertitude in foresight's practice towards

the in-depth application of scientific models. Apparently focusing on the achievement of a comprehensive consensus among participants is ‘unconcilatable’ with the partially informative scientific results of modeling. On the other hand scientific models are the ones which are supposed to be the least uncertain among all sources of information of foresight activity. The three-level approach of methodological construction within the foresight process assigns these models place at the meso-level. Now the question arises: how can we describe the features of this integrated activity? In this sense MFS theorizes the concept: it gives general answers to integration in practice. A special framework based on cognitive science, information theory, modeling philosophy and epistemology, was set up to study these features (*Alács*, 2006),. To shadow the real world information flow, proto-models were created at each of the three levels. The following features are represented in *proto-models*:

- Causality,
- Network of information actors,
- Interaction with the environment,
- Complexity of the environment,
- Non-perfect information channels,
- Time,
- The information pyramid.

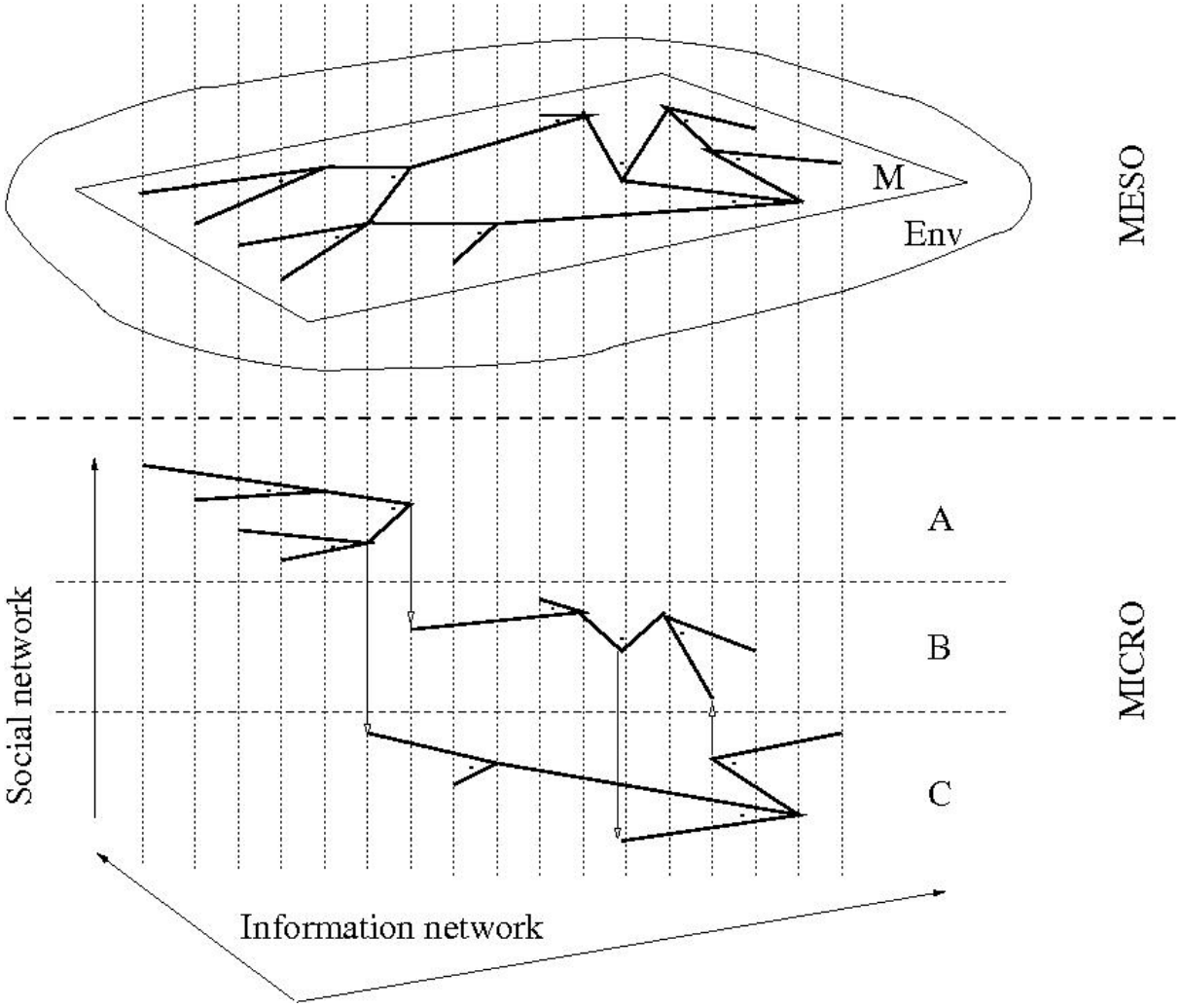
Proto-models are appropriate for general information, theoretic studies to represent the structure of information-flow without representing the information content. This is a pregnant simplification that allows us to use simple mathematical formulations, to describe information flows in all the three-level models. In these terms we can use bits to represent information. The bit is the elementary unit of information that represents the state of an elementary part of the system. In MFS the term information is rather used in the dynamical sense, i.e. information is not the state of the system, but the change of the state of the system. Changes may occur for several reasons, but at the meso-level we assume that all changes must have a reason i.e. another preceding change. This is causality. It is quite straightforward that at the meso-level where dynamics is a defined causality, it is classed as a necessity. Causality might be broken at the micro-level, because decision makers (information actors) are placed in and sense different model dimensions at the same time. Causality might be broken at the macro-level as well, if

the underlying meso-level is not comprehensive, integrating all the effects at the meso-level means that exogenous sources of information must also be included.

At the meso-level between the possible elementary states of the system, causality is represented by elementary decision rules. These decision rules are carried out by the Information Actors (IA) at the micro-level, but at the same time the meso-level is shaped by the IA-s. The mechanism is the following IA-s copy the decision rules from the meso-level. Having made several decisions they sense a certain amount of information flow, referring to that specific decision rule. IA-s are supposed to carry out the decision rules with the most information flow. To achieve this they can either change their position at the meso-level, and copy another decision rule, or change the decision rule (Figure 1). This however does not mean that constant states are less important (perhaps less interesting), but certainly need less information recourses. Obviously these recourses must be limited for all IA-s, which have two major consequences regarding MFS. Firstly, recourses must be optimized by the IA-s. Secondly, copying (learning) is also a recourse-intensive activity, and therefore decision rules at the meso-level must be simple. The network of IA-s at the meso-level consists of simple decision rules, where decision rules are changed in a sort of evolutionary process to maintain the maximum flow of information, optimizing the limited information resourses of the IA-s. At the micro-level this information flow is divided among IA-s. If we consider a group of individuals as IA-s, intra-IA information flow will represent the social network.

In the previous paragraph we described the relationship between the micro- and the meso-level. Now we will focus on the relationship between the meso- and the macro-level. The macro-level from the point of view of the meso-level, is similar to the relationship between a system and its environment, where the system as a whole affects the environment, and the environment's reaction affects the entire system. In MFS environment is represented by a complex decision rule that takes all meso-level information as an input and produces an output that is accessible to each meso-level decision rule. The macro-level is in fact an environment for the meso-level evolution of decision rules described in the paragraph above. But unlike what happens at the meso-level, the macro-level decision rule is constant.

Figure 1. **The relationship between the micro- and the meso-level**



IA-s A, B and C copy the meso-level information structure M, which is placed in its environment (described on the macro-level). The structure on the micro-level consists of the social network (inter IA-) and informational network (inner IA-) dimensions.

Contrary to the situation at the meso-level, where decision rules are optimized by adaptive evolutionary dynamics, at the macro-level some consideration must be made by choosing the one and only, constantly present decision rule. Firstly, the comprehensiveness of the meso-level must be considered. This means that the macro-level decision rule might also depend on some information that is not present at the meso-level (exogenous information). Secondly, the complexity of the decision rule must be considered. Complexity represents the nature of the modeling dimensions. A straightforward and comprehensive environment results in a focused and effective meso-level. If the macro-level complexity is low, it can be assumed, that the simple meso-level decision rules easily adapt, and form a completely different structure than in

the case of a highly complex macro-level, that permits only a low degree of adaptation. Thirdly, the decision rule must either be considered to be deterministic or stochastic. A deterministic but complex macro-level could result in several quasi-stable meso-levels. Determinism can be assumed in case of simple constrains or transparent mechanism. *Stochasticity at then macro-level represents our limited knowledge of the inner structure of the macro-level.* This is not to be mixed up with either not-knowing the structure (uncertainty), or with the exogenous information, as discussed above. Although stochasticity means that some sources of information are excluded from the meso-level, these sources are perfectly known, studied and described as a random effect by statistics. In the case of an exogenous source of information such as knowledge, it is not accessible.

In MFS, information channels represent communication between the different parts of information holders. Information channels transmit changes of information states, but they are assumed to have a limited capacity. This means that transmitting the change consumes resources and these resources are limited. Thus, if a new change arrives to the information channel, the channel might be blocked, saturated in a way that information (about the changes of the states of other parts of the system) is lost (information dissipation). Information loss is an essential property of real world systems. It represents the fact that meso-level information can affect only the states that are in the neighborhood, in relation to the meso-level information network, as discussed above. Information dissipation is also present at both the micro- and macro-level. At the micro-level it represents the resource intensive activity of IA-s. At the macro-level it represents the lagged effect of the environment meaning that changes take on an accumulating nature at the macro-level, and thus responses can be sensed with a delay.

Here one may observe that at each level the most important resource in the processing of information is time. Indeed, information channels define the information flow and information flow defines time. Time is sensed locally by the intensity or speed of sensed changes, but it has radically different meanings at each modeling level. At the meso-level where dynamics presume the existence of a unique time, time is defined by the reactions of the environment. This absolute time gives sense when talking about the past, present and future, that is valid for all the specific meso-level. At the micro-level time cannot be sensed absolutely, only subjective time exists, that the IA-s sense. This

means that time per se does not exist. At the micro-level we can hence talk about the time of a specific IA or just the present. At the macro-level, permanency prevents any definition of time. The macro-level is timeless and permanent.

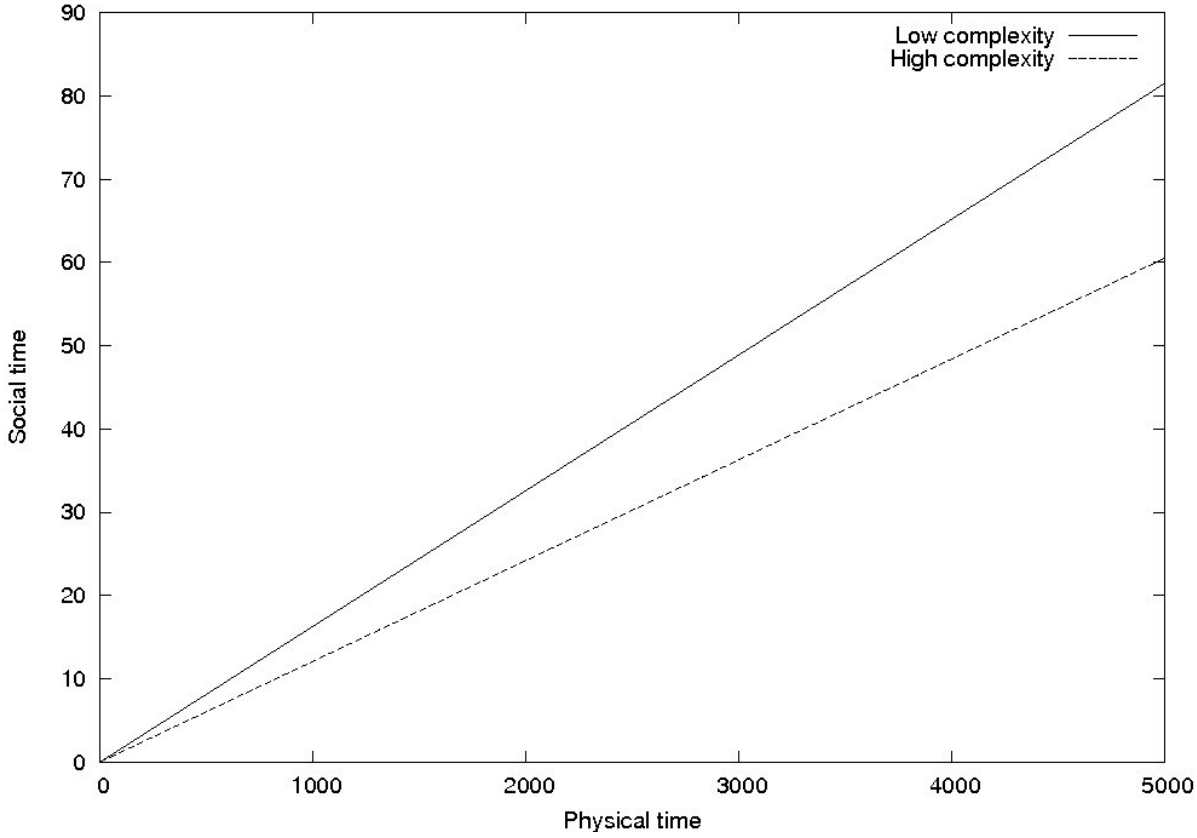
Several proto-model structures can be created throughout the three-level approach of MFS in different modeling dimensions. First the effect of the macro-level complexity was studied. We showed that in the case of higher complexity, the meso-level information structure is more spread, less concentrated, it has fewer centers and these centers are only loosely connected. This structure ensures that information dissipation is low, new innovations (decision rules) are created faster, in other words: higher flexibility. We could study macro-level complexity in relation to meso-level time (Figure 2). Higher complexity results in slower time, flexibility is information intensive. MFS however must also deal with several modeling dimensions at the same time. Modeling dimensions filter micro-level information in a way that ensures the maximality of the meso-level. In the case of several modeling dimensions, one must take into account that in an informational sense, dimensions co-exist only at the micro-level (Figure 3). IA-s can now allocate their informational resources among several dimensions, which in some configurations result in specialized, in other configurations rather mixed IA-s. We understand a completely different complexity this way. The micro-level complexity differs from the macro-level complexity in several ways: it is not the permanent, unknowable, but the known (in the present), but always changing (unpredictable) complexity. This complexity is highly influenced by the information capacity of the IA-s and the structure of the social network. Unpredictability refers to its chaotic nature.

Efficient foresight activity

Through the methodological construction of foresight we aim to increase the efficiency of the process. Efficiency here means the setting up of clear conditions and goals for each stage of the process to increase and to make more reliable information flow. The results of the foresight process are not measurable because these are distributed and shared among the stakeholders' attitude and world-view. Methodological construction means that this is achieved through the careful selection and in-depth methodological study of the applied tools and methods.

Different foresight processes could be constructed by different methods, but there are some typical methods at each level of the process. We apply a method at the first stage for the construction of foresight-specific time dimensions taking the compatibility with the scientific meso-levels into account. In our experience, the future cannot be revealed in its whole complexity, it could be understood in some special, suitable, well-chosen dimensions. In science the construction of one specific meso-level is targeted to find special aspects where better understanding is feasible.

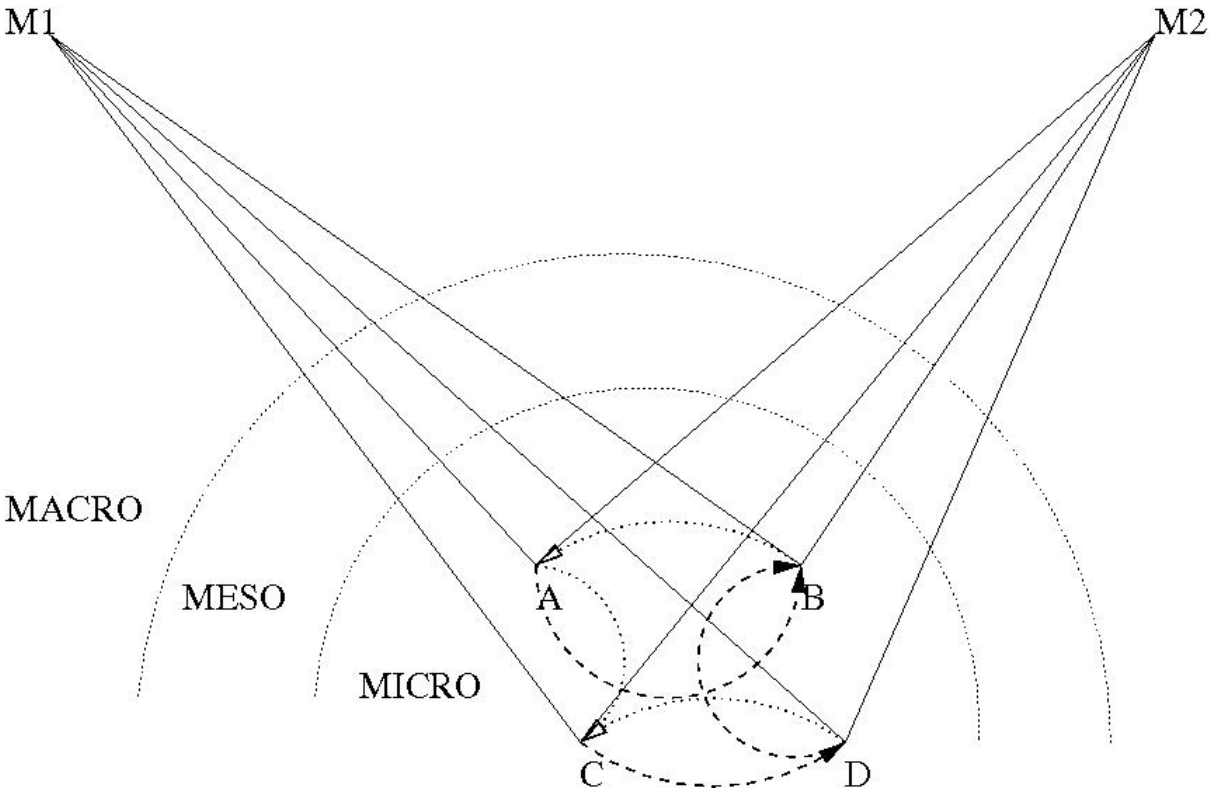
Figure 2. **Social time measured in case of high and low complexity of macro-level**



The meso-level is the suitable point for scientific method to enter the foresight process. At the meso-level, foresight studies explore available information and knowledge to support sufficient information for further decisions. Further knowledge should be created by soft methods in cases of a narrow space of available time-dimensions. Microsimulations, the Delphi method could be applied to explore the future and find the relationship between decisions of stakeholders and time. These methods should not replace nor compete with scientific achievements, because this would decrease reliability and efficiency. On the other hand *these methods should expand scientific*

achievements, because they are obviously not supposed to create the comprehensive knowledge base for the wide-ranged needs of foresight.

Figure 3. **Multidimensional MFS**



IA-s A, B, C and D allocate their informational resources different towards the modeling dimensions M1 and M2.

At the second stage of the foresight process consensus key factors of the individuals desirable futures should be achieved. This means:

- contact with the scientific community to reveal the state-of-the-art meso-levels in science, (Note that the meso-levels of science could be defined as the consensus of the scientific community, but in some cases this is not easy to distinguish from external (non scientific) interests that are not pure scientific constructions.)

- contact with the stakeholders of the foresight process to gain access to their point of view and way of understanding, to reveal the meso-level of practice (individual definition of time). These meso-levels however must be in accordance with each other and the scientifically proven meso-levels.

- expand the revealed meso-levels with additional dimensions to support comprehensiveness.

Without consensus about the key factors, no main message could emerge. At the micro-level efficient methods should be developed in helping the choice of key factors that represent an emerging meso-level message. It is not necessary that based on the chosen key factors a single meso-level could be determined. Special study of non-scientific meso-level knowledge entered. Here data mining and expert panels can both be applied to access specific micro-level information in this sense, and seem to be suitable choices of methods at this stage.

The foresight process can be considered successful if stakeholders' decisions to achieve their own desirable future are sufficiently supported. Therefore the chosen messages at the micro-level should be disseminated to the stakeholders in order to help them agree and accept to change their attitude and world-view if necessary. The chosen meso-level cannot be transferred directly because of distributed knowledge. Therefore macro-level foresight methods should set the importance factors for all stakeholder groups in relation to targeting and the choosing of channels. *Typical methods such as visioning and networking use various channels of communication to facilitate the personalization of the foresight message.*

Finally we present three of the major theories of knowledge that are also supposed to be good candidates to theoretically underpin foresight activity. We also study how data, uncertainty and complexity is introduced in theses theories and conclude the extent to which methods based on these theories can be involved in the three-level approach of the methodological construction of foresight.

Social Constructivism

Data. Data is what stakeholders or participants reveal from their own, specific world-view. The micro-level is poorly defined however the method connects the meso-level to the macro-level. Thus the data are the interpretations of the participants of the 'Construction'. Some authors, who consider a consensus in the foresight process as a must (*Barnes, Bloor, Henry*, 1996). Consensus shall not be aimed to achieve at the level

how stakeholders interpret the data: so foresight would be just a way of manipulating opinions. The key question is just that participants should keep their world-view as their representation of reality.

Time. The whole evolution of time through Social Constuctivism is partial: meso-level time is sensed differently to the micro-level aspects of the participants. In social construction, time becomes irrelevant only its mechanism counts.

Uncertainty. Applying Social Constructivism to foresight we may ask what aspects its methodology should focus on. Arguing that achieving consensus should be dealt with as a goal. It is rather a favorable outcome. Indeed it is questionable whether we are able to construct our future through forced consensus, if we are detached from reality. The goal from the point of view of methodological construction would be just the opposite: to create competing futures representing the uncertainty of future.

Complexity. The different partial consensuses represent the complexity of the selected issue's social construction.. Consensuses also define cliques or communities of stakeholders sharing the same beliefs to a certain extent. A stakeholder may belong to several consensus-cliques. But the complexity of the methodological construction in Social Constructivism lies in finding, raising issues, topics etc. where global consensus can be achieved. These issues, directions if in existence could serve as the basis for a common future. This could be opposed if these common futures were based on trivial grounds and important manners were suppressed. In this sense the foresight process would not simply be the creation of consensus, but the creation of the battlefield. This outcome is not however favorable. The question is whether all actual issues could be reconstructed in terms of non-conflicting issues, creating the macro-level.

Grounded Theory

Glaser's and Strauss's original idea of Grounded Theory (*Glaser, Strauss,* 1967) could help to underpin the methodological construction of foresight between the micro- and macro-level. The foundation of the theory is that the researcher studying micro data shall also address the orientation of the theory.

Data. In foresight Grounded Theory might be useful to deal with the stakeholder's different interpretations of reality. Communities and differences shall be recorded in a way that the largest variety of possible emerging theories could fit the data.

Time. Grounded Theory is timeless: several categories emerge, but do not create comprehensive dynamics. Note that there can be several laws, rules and dynamics that fit the data, but only a few that are also accepted as an explanation. This is the main difference by which Grounded Theory is applied in the social sciences and in foresight: the former focuses on possible theories that may emerge and forgets about the orientation of the data for discovery; the latter focuses on the orientation supplying this macro-level knowledge to the stakeholders, and lets them work with possible emergencies in their individual world-view.

Uncertainty. 'Theoretical sensitivity': the researcher's subjective point of view, in relation to that study of data. Induction can be heuristic.

Complexity. Micro-level definition and collection of data: at this stage the theory must exist in some form.

Evolutionary Theory

Data. Evolutionary Theory works with micro-level data: entities with full-depth complexity of their properties and the usually also complex properties of the environment.

Time. When focusing on Evolutionary Theory, the following question may be raised: what are the possible states of the system that fit to a given environment and which states can be achieved in a gradient, continuous manner. This means that Evolutionary Theory constructs the meso-level based on the micro-level. Note that according to different definitions of entities (micro-level) different meso-levels can be constructed. This however does not mean that the theory would consider the macro-level in-depth.

Uncertainty. The purpose: Evolutionary Theory does not operate at the macro-level. But the purpose of the model can be defined only at the macro-level. What is the

phenomenon that we attempt to model? Foresight Evolutionary Theory shall be applied to help stakeholders develop their word-views and improve their interpretation of micro-level data. Uncertainty arises, because the definition of micro-level may differ among the stakeholders.

Complexity. Complexity of the data. In foresight evolutionary models shall be applied to show features that are decisive. This helps to reduce the complexity of each stakeholder's world-view, but may increase the complexity of the whole foresight process, as misunderstanding among the importance of different features increase.

Conclusions

We showed that the three-level-approach to foresight not only extends the foresight activity, but also clarifies its methods. We shall also realize that *the foresight should be a continuous activity as our knowledge changes*. However this is only possible if its methods are clear and transparent to all of the stakeholders. *Involvement and transparency are both key factors in foresight's efficiency. Tools at different levels of the foresight activity may have different theoretical underpinnings.* For instance, Evolutionary Theory offers substantial fundaments for tools with definite uncertainty, moderate complexity and fully constructed time at the meso-level. At the micro-level, this could be extended by a generalized usage of the data based on the Grounded Theory. This is conceptionally different from methods designed for the macro-level. At the macro-level for instance Social Constructionism could support principles of shared knowledge for specific methods.

The foresight activity itself has diverse goals, but we define clear objectives for the methods at each level. This can make the foresight activity more reliable, more efficient and even more successful.

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Helga Veigl

Interpreting and using weak signals in futures studies

"You cannot teach a man anything;
you can only help him find it within himself."
(Galileo Galilei)

The constructivist world consisting of processes and interactions

The baseline of the constructionist approach

The constructionist approach is based on the individual who constructs the world for him-/herself, and reality for all people differs, depending on the cognitive mind that they have constructed for themselves. Based on this, it is evident that not all information reaches all people in the same way; accordingly, their response is also very different. Defining weak signals under the constructionist approach, we assume that *a weak signal is weak because not many know about it, or if they do, then most do not really know what it refers to and what process it fits in.*

The characteristics of the processes

If we consider the events, happenings, developments and changes of the world in their continuum, we will ask what role the different processes have, how old trends continue, and what kind of events has the potential to start a new process? A futurist is interested in seeing trends that will prevail in the future, and looks for signs indicating the emerging future processes which can reduce instability, also helping decision-making in the present. Most processes can be described as an S-curve (*Nováky*, 2007): imagine a coordinate

system where time is indicated at the horizontal axis and the characteristics of the process such as its acknowledgement or spread are represented at the vertical axis. The first section if this S-curve the process is having low acknowledgement yet, there is not much information and only a few of us recognise its emergence. Weak signals are such signals that can be emitted by a changing element of the environment.

Humanity continuously evolves in its physics, soul and spirit alike (thinking within the concept of evolution or intelligent design). Within this framework processes appear cyclically: there is always something new appearing that is spreading and becoming prevailing. The processes that are still at an early stage of their development also emit signals called weak signals indicating their existence. We can consider the system of processes as fractal and extend it without limits, increasing or decreasing the time-length of a process. Each process consists of infinitely small processes, and, theoretically, each process fits in with a bigger one. It is the same approach as the one used for the analysis of economic cycles, i.e. seasonal cycles, business cycles, the Kondratieff cycles, etc that are not mutually exclusive, rather, they are complementary as regards different time perspectives. As a consequence, theoretically, each event or process is a weak signal because we can always find a curve in which it is an initial manifestation. It is not always possible to notice, identify and observe processes, and their source also varies according to the period of the process we are in.

Each process (environmental, societal, economical and political) that occurs in the world can be notified, hence emit sings. Under another approach, each process has their own initial manifestation, however, we cannot receive, sense, interpret and evaluate it. If a process reaches a certain level or crosses a threshold, then it becomes clearly visible and evident, and as such it is treated as a fact. But before that happens, it is still a long way to go: the question is how we can transform the initially received signals into information that is useful for others, and can contribute to development, as weak signals can only be considered weak in the framework of the whole process.

Interpreting the signals emitted by processes

The signals of the evolving futures can be observed in the present: they carry a message for us about futures. In the present there is a lot of information that refers to the future. They are sometimes obvious, sometimes not, but they still provide an indication of how the future can evolve – we can think of bills, investments or demographical trends. The futures extrapolated from the present are only one or more possibilities, but we have to leave possibility open to other futures as well, and be prepared for them – like the jettison of the bill, the fail of the investments or new diseases' or treatments' upcoming. The signs of the past and the present referring to the future can be observed, but we cannot obviously make conclusions in respect of the future based on them.

A signal, according to Coffman, means the following: a happening in which an individual or some other part of the environment transmits a message through or as a result of their/its action or behaviour (*Coffman*, 1997). Spencer uses the concept of signal in the economics of asymmetric information, where, simplifying the filter theory, employees emit signs, in this case study or the qualification, and so the employer knows that he/she faces a 'good worker' (*Kun*, 2004). In line with this, we can see the analogy: this bears relevance to us, as these signs are realised in a form that is different from what they refer to (for example a good worker is supposed to be qualified, and educated, proving that he/she is suited for the job).

Not all signs are visible, observable and comprehensible (*Coffman*, 1997). There are three groups of signs according to comprehension:

- signs that we cannot receive,
- signs that we receive, but which we cannot sense,
- signs that we receive and sense.

These three groups match the signs emitted by the processes identified in futures studies. These three cases are complemented with a fourth case when we not just understand the information, but also use it, integrating it into our dynamic system, in our cognitive structure – this is when a weak signal becomes a message. The different levels of signs and

their characteristics are shown in Table 1.

Table 1. **Type of signals**

The name of the sign	**The characteristic of the sign**
unreceivable signal	we cannot receive it
silent signal	we receive it, but we cannot sense it
information	we can receive and sense it
weak signal = message	we integrate it into our cognitive structure

The first kind of signals is *unreceivable signals*. They do exist, and as elements of the interactive system they indicate change in this level, but we cannot receive them without appropriate equipment. The emphasis is on the goodness of our perceptors: it would be useless to train ourselves to receive radio waves with our ear or other parts of the body, because only the radio has this function. The aim is to transform these signs into perceived signals, and, towards this end, we need to hone our perceptors in order to be able to perceive more and more from the world. In the next category there are signs which we can receive with the appropriate equipment, but which do not get identified consciously. S*ilent signals* are impulses that are perceived by the individual, but which are not perceived or got incorporated into our conscious. However, they do exist in the unconscious, so we carry them in a deeper level, and, if is necessary, we can develop them. In the third category there are those received and perceived signs that affect our behaviour, the signs that could be turned into messages. At an informational level we perceive the signal, it is identified consciously, but is not incorporated into our system, it is just a specification: data that do not have a place or a role in our mental models. Even if it is not necessary to interpret all information about a change, it would be useful to structure all information due to the complexity of our world.

Under the theory of information, there are two approaches: according to Wiener's information theory, information is related to order, so information is the opposite of entropy; while Shannon's theory refers to the fact that information can be measured according to its novel content. Thus, on the one hand, signs orient us and contribute to our understanding of the world; on the other hand, they surprise us and carry novelty. To be able to recognise, identify and utilise novelty, we should not let them disappear in the the information of the first category. Weakness is derived from the fact that, in interpreting signs, we do not know which information can really project the future, because if we knew that, they would not be weak signals. Weak signals have two characteristics of the information mentioned above: they bring order into a system – usually in a developing system that is taking shaping, one that is just emerging, and of which we do not know much and so we would like to understand its function. Furthermore, they carry novelty because they are information that we did not have before, and they are probably surprising – if they were not, we would have known what to look for and which source to use. Weak signals are signals that, theoretically, could be reached or interpreted by anybody if we were more open and we had all the available knowledge.

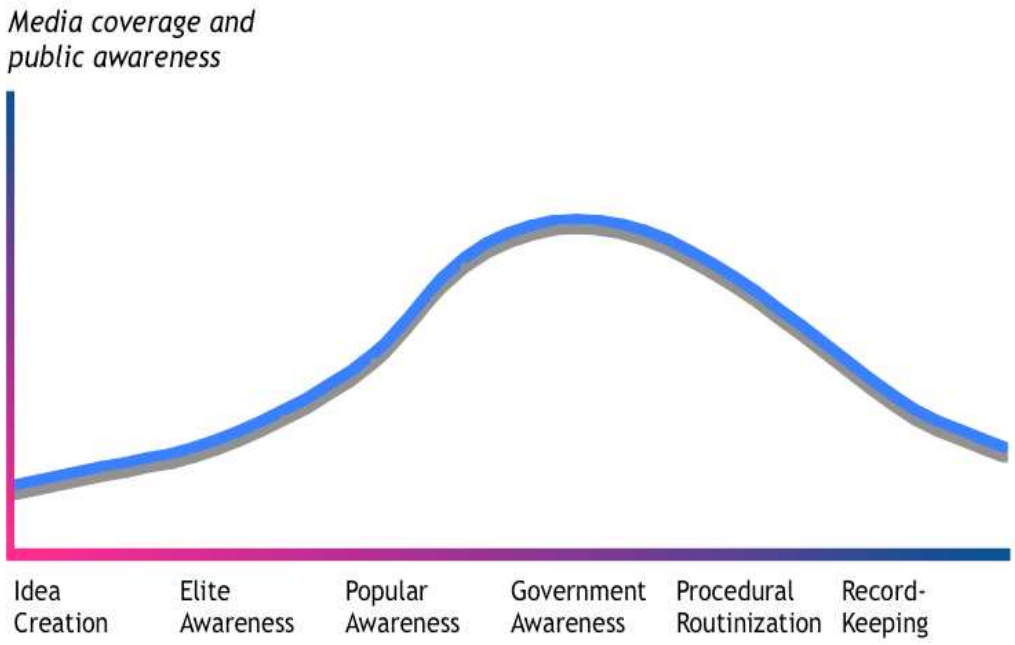
The sources of weak signals

Weak signals never refer unequivocally to one thing that is why they are weak. Those signs that are considered weak do not reveal unequivocally the process they belong to, or those that refer to a process that is not unequivocal where they evolve, and have the potential of not becoming a prevailing trend. Detecting all signs of change is not possible for humans, thus signals are weak in many cases.

Researchers of weak signals usually propose to start from sources from which there is a chance for a future trend to grow, like artistic works, patents, blogs or science-fiction (*Hiltunen*, 2007). For this last we do not have to look far, we know Jules Verne! Concerning art we can see that they capture societal problems very sensitively, and reflect to those much more early than other official forums (*Karakostova*, 2006). Blogging is a brand new genre, and its use has spread fast: they are exquisite sources for finding weak

signals, which show what is going on in the world. Figure 1 shows that in the certain levels how weak signals are spread or appearing the process (which we cumulate in order to get an S-curve), and we can also see where we can find weak signals, what their main sources are.

Figure 1. **The appearance of weak signals**



Source: Choo (2006), adapted from Hiltunen (2007).

In the phase of *Idea Creation* an idea is born expressing something new. This can be a piece of art (e.g.: avant-garde (*Karakostova*, 2006)), science fiction, primarily a book or a film (e.g.: the books of Jules Verne), extreme and alternative press (e.g.: Civil Radio – not profit-oriented, thus there appear such themes that are relevant but which carry no profit), professional press (e.g.: medical press), patents (e.g.: patents on genetics have been already in the 80's), PhD dissertations (e.g.: ecological sustainability in the 90's). These signals are weak for the others, that is why it is important to notice and support these opportunities that are yet very weak and can be influenced and strengthened or weakened as we would like to reach or avoid the future that they project. However, there is a risk in being weak since it can also be deviated and influenced according to one's selfish interests. The signals of Idea

Creation are very weak also for futurists; hence, it is difficult to make them useful and ‘marketable’.

The inner newsletters (e.g.: information for dealers by multinational companies), research results of analysts or banks (e.g.: occasional papers of the National Bank of Hungary), professional journals (e.g.: on IT or geology), scientific-technologic journals (e.g.: ‘Life and Science’), popular science journals (e.g.: ‘Life and Literature’), journals for decision makers (e.g.: ‘Economic Review’) are all part of Elite Awareness. This is the phase when many are not aware of the process just a few of a given background. In this phase weak signals are known in a wide range, and primarily the interdisciplinary thinking and the complex view can reinterpret the signals showing a new way for the signals and projecting a new process. The signals in this phase are weak because they cannot yet project the whole system; rather, they are present only in certain sectors. Futurists focus on these signals primarily, because they can mediate the processes from one sector to another, and influence the future to exercise complexity and so the many specialities would be harmonised.

In the phase of *Popular Awareness* we can get information on the processes through radio and TV programmes (e.g.: survey of the laymen on the street), daily journals (e.g.: ‘Daily Economics’ - there is always something about ‘interesting’ issues), general magazines (e.g.: InterPress Magazine), publication of interest groups (e.g.: KOVÁSZ, ecological journal at the Corvinus University of Budapest), surveys (e.g.: voting via the Internet), fiction and non-fiction (e.g.: the list of the best-sellers could be interesting). Popular Awareness does not include weak signals for most of the people, even though it can be still weak for some people, as the consequences are not well developed and known. Futurists have a possibility with these kind of information as well as they would be and should have been used more often in decision making, because they are typically those that we aware of, only we do not know what to do about them or how to relate to them – a typical example of which is global climate change: we know about and we are aware of the existence of the process, but there is no global commitment from the different entities even if they are fully aware of the possible consequences.

The phase of *Government Awareness* means participation in decision making, so when the process is no longer a weak signal and reaches a level where the government's decision-making takes it into consideration. The process can manifest itself as reports and studies supported by the government (e.g.: economic issues, like investments), papers on governmental policy (e.g.: tax issues), legislation drafts and bills (e.g.: introduction of GMO agricultural products in Hungary), open discussions (e.g.: environmental issues).

When the process reaches its *Procedural Routinisation* phase it is a known and regulated phenomenon. The sources for this phase can be: governmental policies and regulation (e.g.: regulation on accessibility in Hungary, while it has recommendations in Sweden), institutional staff (e.g.: the changes in the role of the government commissioner of the cyclists), government filings (e.g.: bio fuels), professional associations (e.g.: associations for social interests), educational training (e.g.: manuals of Internet-use).

In the phase of *Record-Keeping* media attention directed at the process is low again, as it have become the part of the everyday practice like legislative documents (e.g.: privatisation), authorities' or institutional archives (e.g.: compensations), government filings in historical archives (e.g.: the proposals for the reform of the pension system), studies analysing the history (e.g.: economy of the socialism).

The subjectivity of weak signals and their connection to the cognitive structure

The weak signals in the cognitive structure

At the beginning of the third millennium humans face other problems than our ancestors did. For today the flow of information has speeded up, and on the Internet almost everything is accessible. Today we have fame not for information itself but also we are tending to frame a cognitive structure and grab its dynamism. Modern education focuses not on lexical knowledge but on the analysis of the interconnections. Today a signal is unworthy if we are not able to put it in a context, find a place for it in our 'box' in the cognitive structure.

One of the real challenges is to shape consciously our cognitive structure. The questioning of the results of natural sciences, the development of social sciences by leaps and bounds and the growing demand for esotericism all show that individual search has begun and the individual consciousness is in the focus for some decades. This also means that everyone has an own thinking pattern. What we believe in and how we see things is important, but also in which level and where we put it in a mental model. The signs can be perceived by everyone, but is not weak for all.

Let's see what the elements of the system are along which we think. We suppose that we shape our thoughts in a structure that is provided for the individual (that could be also an enterprise or some other unit that is homogenous), and the individual is embedded in the environment. The environment influences the individual, and also the individual influences the environment. If they are in interaction, then the system does dynamically change. Individuals should adapt to changes, or pro-actively go beyond them and shape future and the changes. Individual change only when they feel that they have an interest in it. The individual brings about changes when there is a push or change from the environment, the question is that what is that impulse that starts the intention of change in the individual and when he/she become aware of that impulse.

The environmental elements do always change, and not all the changes can be predicted, as there are many futures. The elements of the environment in their dynamic change and shape show the way where they go, and the individual can get information about that. But it becomes useful information just when the signals are evident for the individual and he/she can build them in his cognitive structure.

An upcoming theory, method or principle should be first built in the cognitive structure to be accepted and become general. In general, this starts from individual level and if it reaches the critical mass then it can be integrated in a higher level as well by others as well. If we are able to sense and interpret well the signs then we will able to take part actively in the shaping of our own future. For this we have to understand that is not enough to keep our

eyes open, we ought also to be open-minded enough to integrate and comprehend in the sense of being able to put novelty in our cognitive structure understanding change is not convulsion: if we notice changes in time we will have time to adapt and influence, and future not just happen to us, but we also have an active role in it.

Weak signals are such information that refers to the functioning of the system, and carry information about its change. If we are not ready for change, then it will not settle in the cognitive structure and it will remain empty data. If we are able to understand that and build them in our cognitive system, then they will be weak signals. Weak signals remain weak also after identification, so the chance of supervention is another issue.

Weak signals are always subjective and depend on the cognitive structure. Consequently, we cannot unequivocally say that this or that is a weak signal: for someone a sign is a weak signal and for another one the whole process is sensible. For the observer the cognitive structure, comprehension, information and the intensity of the knowledge matter.

The subjectivity of weak signals

The most problematic question about weak signals is to define when a signal is weak and when it is not. Everything is subjective, that is what makes a signal weak for someone. To ease the interpretation of this concept we better clear up what we consider a relevant process and what kind of groups we can form of these. If we do this, we can see that weak signals can be identified and handled easily without the dilemma that there is an endless number of processes and we do not know which signal refers to which process. We think better in a complex system of interactions that show the possible changes of the future by all the perspectives of the participants. Hence, weak signals are interpreted from the aspect of the observant, and thus it defines the subjectivity of weak signals as well.

To be able to notice the signals and see the world around us in new ways, we have to get out of everyday habits. *We should use other point of view to be able to understand and receive information on the conscious level instead of ignoring it.* An example for this is

Chinese economic boom: China's economic fall into the line is a consequence of its comparative advantage by labour, and the economic growth is still widening that is a risk for European producers. With a protective policy it should have been prevented many decades earlier if we would not project China from our history books, but we see it as a competitive and rich in labour competitor.

Weak signals in futures studies

Futures studies has a special role in science: it intends to strengthen the role and significance of actions by individuals and society to draw the attention to the interconnected relationship, and it also emphasise its aim of improving future thinking and thus raising consciousness. Futures studies is interdisciplinary as it integrates knowledge from all scientific disciplines and uses the holistic approach to decrease the instability of the future felt in the present (*Hideg, Korompai, Kovács, Nováky,* 2006). Weak signals are signs that exist in the present, potentially evolving in the future and are difficult to detect (*Hiltunen*, 2007). Weak signal research is a possibility to futures studies to deal with instability, and channel information to the individuals and societal groups with a new approach.

Alignment according to the way of change

The weak signals can be aligned according to the change that they can potentially induce. This means that weak signals, as they evolve, have the potential to induce change, and we can group changes according their main issue. Adapting a holistic approach we usually use STEEP, to differentiate societal, technological, environmental, economic and political topics. Simplifying this we can reduce it to three main groups: natural, societal and technological that refer to the process in which weak signal potentially strengthen, and that process what characteristics has and in which aspect does it play a role. A further advantage of this is that within these groups we can see other partial processes as well in general that helps more the research, interpretation and use of the weak signals.

Natural weak signals usually refer to phenomenon that was not a possibility before or to one that was known before and we have evidence that represents it in a different matter showing new possibilities. Societal weak signals can be delineated easier than natural ones, even tough there are many types of it. If we would like to simplify it, we will say that there is a classic pattern: idea creation, spread and evolving/effect that could be concerned to all of the weak signals. Technological weak signals are the easiest one to define: idea creation, planning/implementation and use/spread. Societal and technological could be more aligned to get weak signals interpreted in the partial processes as well. The further aim of the alignment of weak signal is to segment them when we build a database.

The futurists' task with weak signals

The main characteristics of weak signal that they are not obvious, and that is why decision makers do not like to deal with them – why spend time on such things that are nearly invisible? The answer is pro-activity, which helps us to avoid the situations where we have to respond to changes, but we cannot be part of them, and we do not have any chance to shape the future. Futurists as interdisciplinary scientists have he task of channel the information that weak signal represent. E.g. in participatory futures studies the opinion of the few is important as well, and maybe they are knowing something that is a weak signal for others, e.g. to decision makers; during their work futurists can channel information, that in the case of weak signal is especially important. Another example is the interconnection of different disciplines, that maybe have something to say to each other, but without knowing it they do not communicate, but if they would, maybe it would have been easier to both of them. That is why futures studies with its interdisciplinary approach have a critical role in the interpretation and in the use of weak signals.

Weak signals and the scenario method

The futurists have the responsibility to shape adequate and acceptable future alternatives, and communicate them towards the stakeholders (*Nováky,* 2007). One problem with weak signals is that it is difficult to communicate them and make their existence and potential

accepted. Since they are weak it is easier to sweep them off, moreover their uncertainty suggest ignoring them. Weak signals are interesting until they show exciting and new futures as a stir. But when the responsibility and the necessity of action come up with weak signals, people are more rejective, as change and changing are always a difficult task for everyone.

The method of scenario analysis can integrate weak signals in the futurists' work. When we build scenarios the small possibilities do count as well, scenarios can treat the strengthening of weak signals moreover it seeks for them. *Scenario method is very important as it helps weak signals to be built in the cognitive structure.* As it is a method that collects ideas of the actors, and could do more than just mention weak signals: it describes and tells in the scenarios the possible consequences. Thus, weak signals become comprehensible, and they are also protected from automatic rejection, and become integrated in the shape of the future.

Conclusions

Futures studies has special potential to treat weak signals and find them a place in the complexity of the world. The objective of future studies is to collect weak signals, to explore interactions and offer broader understanding to the society. Weak signals need to be treated, referred to use for shaping the future. The weak signals could be used together with well-known methods of futures studies, among them with the scenario method.

We always have to keep our eyes open, making it possible to discover new futures and shape them. The task of futurists is to manage and harmonise these actions, and channel the information for those who are not aware of the future possibilities and threatens. Uncertainty grows around us, but if we handle it, we can live in the present a more valuable life too. Until today we were not able to manage change as we should have done, but if we are look for signals and act in time, we will be able to avoid those threatening processes that we have provoked for ourselves.

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Éva Hideg

Technology Foresight and Its Contribution to Advancing Participatory Democracy[1]

Foresight as a new, democratic means for shaping the future

Futures studies into global world models and social future models has revealed that these models cannot yet be regarded as forecasts but rather as possible social futures, and their implementations depends strongly on human values, expectations, choices, actions, and taking risk and responsibility. This recognition has led to the emergence of a new futures theory. During the 1990s a new futures theory was elaborated with the appearance of critical futures studies (*Hideg*, 2002). These critical futures studies defined the 'future' as something that already exists in the thoughts and emotions of people. According to R. Slaughter's definition of foresight: ' .. a universal human capacity which allows people to think ahead, consider, model, create and respond to future eventualities. Founded on the rich and inclusive environment of the human brain-mind system which, crudely put, has sufficiently complex neural 'wiring' to support an extended mode of perception whose main functions are proactive and facilitating. Future thoughts and perceptions affect present occurrences and form an organic part of human 'life- world'' (See *Slaughter*'s Glossary). This human ability is called 'foresight' in critical futures studies.

The key feature of Slaughter's definition is that foresight exists at individual level but it can also be extended to the community or the whole society. An individual is able to envisage both his own and his community's future. Both types of future thoughts and perceptions are forming and reforming the process of social dialogues and are embedded in the process of social innovation until the phase of shaping the future. Consequently, futures existing in the present are open and are humanly constructed;

thus human and social future hinges strongly on human values, choices, actions and responsibility.

Foresight as a new meaning of the future places not only the future in the present context, but it expresses that the future, as a human affair, belongs to every human being as well. The issue of democracy has also been placed in a new context in this way. *Shaping the future is a human and democratic action in this meaning of foresight.* The development of anticipatory democracy is very important therefore foresight should be an everyday practice. From another aspect, the fulfilment of anticipatory democracy can also be regarded as a tool for democratisation of society. (*Pateman,* 1970).

During the 1970's futures studies served to introduce the idea of anticipatory democracy (*Toffler*, 1970, *Bezold,* 1970). In Toffler's words (in 1970): 'To master change, we shall therefore need both a clarification of important long-range social goals and a democratisation of the way in which we arrive at them. And this means nothing less than the next political revolution in the techno-societies – a breath-taking affirmation of popular democracy.' (*Toffler*, 1970, p477) Bezold and Toffler recognised that successful management of changes would need the involvement of people in the process of shaping our future. From the 1990's foresight, as interpreted by critical futures studies, regards human participation and cooperation in the process of mapping out the future as evidence or as basic characteristic of every foresight activity. Since that time, *the fulfilment of anticipatory democracy has become a central issue in the development of different foresight procedures*.

Critical futures studies has developed several new tools, especially subjective methods, (e.g. futures wheel, futures workshop techniques, causal layered analysis etc.) in order to bring more and more future thoughts to the surface and to stimulate more and more people to participate in discourses about the future (*Inayatullah*, 2005). Different foresight procedures have been produced to promote democratic participation. Foresight training procedures have been worked out to expand future orientation of individuals, including their ability to share in participative foresight activities (*Major et al*., 2001, *Schultz*, 2003). Foresight management and institutionalisation at organisation level, is also under development. An important goal is for more and more employees to be

involved in the future shaping process in various organizations (*Daheim, Uerz,* 2006). Theories of technology, regional and social foresight have been elaborated for helping policy and decision making (*Miles et al*., 2002). A number of other foresight case studies are presently in progress to define suitable foresight procedures for advancing democratic participation.

Analysing foresight procedures in the aspect of anticipatory democracy we have found that an increasing number people take part in shaping the future, alongside experts and futurists (*Keenan at. al.,* 2006). People take part in the foresight process as active participants, so-called 'stakeholders', who bring into play a certain social sphere, or as citizens who express their expectations concerning a certain social sphere. *Involvement of stakeholders and citizens in the foresight activities has become an attribution of foresight.* Besides free expression of opinion, there are widespread discussions about futures issues among foresight participants. Main common features of these foresight procedures, in the aspect of anticipatory democracy, are as follows:

- involvement of stakeholders and citizens in the foresight activity,
- voicing free criticism about the present and the past, including the course of development during the foresight procedure,
- free expression of stakeholders' ideas about futures,
- free discourse about futures possibilities, with the participation of different stakeholders,
- extending stakeholders' knowledge about the future, or help them to understand each other at least,
- induce changes in stakeholders' mindset, to bring them to cooperate and act responsibly for achieving the future,
- make efforts to find connections between future ideas and present actions in the network of interconnections.

Studying foresight procedures it can also be seen that *every foresight procedure mentioned is developed in a way that it can be fitted to a given phase of democratisation of the whole society*. Foresight training procedures are materialising to improve future orientation of young and/or everyday people. This activity can contribute to the education of conscious and responsible citizens. Organizational/corporate foresight is

aimed to develop employees' participation and to use employees' foresight capability in shaping the future of organizations. Organizational/corporate foresight works to promote involvement of employees. Technology, regional and social foresight is designed to involve people as stakeholders and citizens in the future shaping process in their communities and to involve them in policy and decision making. In this way they can contribute to the democratisation of policy and decision making.

There are notable differences between foresight procedures, based on the kind of democracy ideals they are founded on. Some foresight procedures serve the idea of representative democracy, while others serve the idea of participatory democracy. It is worth to differentiate in this respect, even if the aim of every foresight procedure is the fulfilment of anticipatory democracy. Given the fact that anticipatory democracy is also a tool for democracy and an integral part of the democratisation process, therefore its content depends on the idea of democracy, taken into consideration as a starting point by foresight professionals. The analysis made from this aspect shows that foresight training procedures and organizational/corporate foresight are based mostly on the idea of participatory democracy, while foresight procedures that can be linked to policy and decision making, are mostly based on the idea of representative democracy. Developers of both foresight training and institutional/corporate foresight procedures endeavour to involve all their students and employees in the process of future shaping. This opens the way for working on the idea of direct participatory democracy. On the other hand, developers of foresight procedures serving policy and decision making want to involve experts and representatives of different stakeholders, among them representatives of citizens. This is understandable, because they are working under the given social-, institutional conditions. The foresight procedure applied by them has to be tailored to fit to existing social conditions.

Main characteristics of technology foresight, from the aspect of democratisation

It is apparent (in the previous chapter) that technology foresight has developed on the basis of representative democracy. This characteristic feature clearly distinguishes it from all other foresight procedures. Some other characteristics also derive from the fact that technology foresight has followed its own course of development, such as:

- building close connections to policy and decision making,
- helping to implement the principle of subsidiarity in practice,
- applying the principle of representative democracy in the selection of stakeholders and in determining the role of stakeholders in the technology foresight procedure,
- involvement of the authorities as stakeholders in the technology foresight activity,
- consensus building among stakeholders, this being the main goal of this foresight activity.

Existing close connection with policy and decision making certainly guarantees faster development and propagation of technology foresight. This practice of technology foresight is gaining ground particularly in the European Union (*Keenan et al.*, 2005). Its institutionalisation has also begun. Nevertheless, it is yet unclear whether this foresight activity serves the dissemination of future ideas, developed by present key stakeholders, or whether it will bring to the surface future ideas of stakeholders and allow their free discussion. Meanwhile, signs of increased bureaucracy can be observed in the process of institutionalisation of technology foresight. For example, only one procedure is acceptable for preparing technology foresight, in case it is not in harmony with the aim and object of an ongoing foresight procedure.

The ambiguity and formal solutions, applied by technology foresight, with referred special characteristics, endanger free discourse among stakeholders as well. Consensus building is overemphasised, regardless whether it is possible to arrive at it or not, or even the time factor. Too much attention to consensus building in the process of technology foresight can also be harmful from the aspect awareness about uncertainty of the future and bringing to the surface of a wide range of possible future ideas which differ significantly from the ‘consensus future’. *Applying the principle of representative democracy in foresight activity cannot offer a plausible solution to achieve anticipatory democracy, because present power relations are expressed in the process, whereas the future is supposed to be open and shapable.* Based on the present power settings, this practically means that future alternatives and the ‘consensus future’ prepared within technology foresight procedures do not differ from futures tuned to ‘business as usual’

tone. The new outlines of technology thus taking shape reflect the interests and expectations of developers and manufacturers, while long-term environmental and social impacts are not taken into consideration. For example, researches and implementation of new results in the area of biotechnology take place without social endorsement and preliminary analysis of environmental hazards. This example and similar occurrences signal that democratic character of technology foresight is endangered even in case an increased number of stakeholders are involved in the foresight procedure.

We need to mention the aspirations of technology foresight in Europe. Some foresight professionals say that foresight should brake away from the futures studies and follow foresight procedures developed in the area of technology foresight. Namely, the foresight activity that builds close connections with policy and decision making can qualify as the only foresight with a European character and therefore worthy of institutionalisation and propagation (*Keenan et al.,* 2003). This aspiration is harmful in terms of futures studies, because *it leads to separation of foresight knowledge segments instead of supporting synergy of experience acquired in the course of various foresight activities*. In a period of instability, the possible sidelining of foresight activities that do not harmonise in methodology and goals with the given and preferred technology foresight, can become an unwelcome feature in European foresight theory and practice (*Hideg*, 2007).

Technology foresight has accumulated wide experience in the area of democratisation. It has developed the way of involving key stakeholders of researchers, manufacturers and authorities in the spirit of representative democracy. *Technology foresight activities have not yet become the organic part of democratisation of technology management and governance.* Foresight activities are not carried on regularly and they connect to technology management and governance only in ad hoc way. Its institutionalisation would not serve well further democratisation, either in the field of technology foresight or technology management and governance. If further development of anticipatory democracy is important for technology foresight then the course to be followed by technology foresight development is clear: *to find new solutions for fulfilment of*

anticipatory democracy that can contribute to strengthening participatory democracy in technology management and governance at different levels and fields.

Why does the development of technology need anticipatory and participatory democracy?

It is reasonable to ask why future development of technology needs democracy? There is huge competition in the field of technology development, especially in the field of forefront technology development. Each new, hopeful idea and innovation is qualified as secret strategic information. Many experts, among them foresight experts, think that only a few innovators, with very creative minds, are needed for achieving breakthrough results. If there are sufficient economic resources for financing innovations and their coming onto the market, then the 'islands of excellence' can generate spectacular development for a country. I think the idea of 'islands of excellence' is not sufficient to get to the forefront of technology development or to speed up the socio-economic development of a given country in the beginning of the 21st Century. The forthcoming decades will pass in the spirit of knowledge-and interactive society (*Hideg, Vág,* 2004).

The idea of knowledge society is based on minimising social loss of information paradigm. In other words it means that opportunities of information paradigm should be utilised in a socially effective way. Therefore it is not sufficient to be well informed but also to be capable of transforming information into knowledge in our era of information. Creation of new knowledge should not only become continuous activity but also be a part of the social reflexive learning process. This means that new and socially useful knowledge is placed in context and is used creatively. Knowledge develops by being shared among people and by use in a concrete situation. This type of knowledge creation is characteristic not only to technology development and innovation but also to a wide range of other activities as well. For this reason the development of individual and social knowledge base, closely linked with one another, has become a key issue of social development. In the context of democratisation this means that the emergence and propagation of active and reflexive participation should be part of the evolving knowledge society.

The idea of interactive society takes another step ahead. We should know not only how to act in a given situation but also how to become constructive as components of a complex system. To this end, we need to know how to define our position in a complex system, how to communicate, cooperate, perceive signs, respond reflexively, think and act responsibly in our position. This so-called 'interactivity' can be seen as a way of functionality in post-modern society (*Leydesdorff*, 2001). If the new knowledge is 'created' through interactivity of different contexts and ongoing social dialogue, then this knowledge creation could also measure the performance of society. This new knowledge, including the technology knowledge, not only propagates simply from the centres but is also generated by society in a different context. We can therefore state that democratisation by participation belongs also to the advancement of society (*Barber*, 1984 and *Baiocchi*, 2003). *Participative democracy, in its different complexities, constitutes a new position for the human being to competently exercise his influence.*

Studying new ways in innovation, Chesbrough proves that innovation, as a process, becomes open in the aspects of actors and new needs that need to be satisfied. This opening up innovation can be meant as a new emerging paradigm of innovation (*Chesbrough*, 2003). Hippel states that user-developed innovation is very effective way of innovation activities (*Hippel*, 2005). The technical, economic and social development in Finland can show a case of this line of innovation development (*Markkula*, 2002).

At the level of expectation and scientific communication it is established that new knowledge is generated by its use and sharing. Every new technology needs natural, economic, social and intellectual resources. Among them the social resource, i.e. an environment that inspires learning, is of great importance because it enhances intellectual capacity. Given that technology can produce dangers as 'side effects' and this fact should be made public in the introduction of an innovation. Innovation is not only new knowledge, embedded in new technology, product, service, but also *reflexive knowledge that gives meaning to novelty in social, organizational cultural and human quality terms*. Harmonized cooperation is also needed among different actors during the whole life cycle of innovation, because even a knowledge particle can contribute to new technology. Actors are people who have competent knowledge and can reflect, i.e. they are able to generate new knowledge thus contributing to the development of new

technology. *Emergence of cooperation among actors is not only a simple matter of organization, but a functional way of participatory democracy. With a view to the above, participative democracy does not equal with dilettantism but with the mode of generating new, reflexive knowledge.*

Another result from this line of thought is that technology foresight can be understood as a scope of creating new reflexive knowledge on technology. It deals with creating expectation knowledge regarding new technology including extension of socio-cultural function on a time scale. Therefore, the whole social process of developing new technology, that also comprises technology foresight. *Technology foresight, generating new reflective knowledge, also has a democratic character in terms of anticipation and participation.*

Some methodological issues concerning advancement of participatory democracy in technology foresight

If technology foresight is interpreted in the mentioned way, then the next question that arises: how should technology foresight be developed to meet changing social needs? One possible answer to this question is that the development of *technology foresight should promote open foresight activity*.

The idea of open foresight emerged from the area of organizational/corporate foresight. *Open foresight* is based on the assumption that business can shape future contexts and markets through communicating the dynamic interaction between social, technological and economic forces, in an open dialogue (*Daheim, Uerz*, 2006). It can be characterised by transparency, methodological variability, context orientation and participation. It focuses on interactivity of communication and open discussions among the participants. Openness of foresight can be explained from three aspects. It means (1) the involvement of competent stakeholders of different areas and levels who can be associated with the topic of foresight, (2) it should be open to environmental issues, (3) it should be organised as an open communication process. This idea of open foresight tallies with the idea of open innovation. If innovation could be opened up for users on a wider scale, then technology foresight should also be supported by users and potential users, besides traditional key stakeholders.

First steps to be taken towards open foresight include recognising the importance capturing even weak signals and wild cards. Hiltunen suggests that every employee in an organization should look out for signs coming from 'wherever', this would be important in the life of an enterprise. After communicating and filtering these signals, a part of them could be entered into the information database of foresight activity (*Hiltunen*, 2006). In other words, mapping weak signals and wild cards could be more effective if every employee could participate in capturing such signals or 'giving' signals, namely recognising the importance of signals.

The development of information resources by expanding participation can also be of great importance for technology foresight. This can be the first step that should also involve other methodological revivals which can be connected to the development of foresight democracy. Four methodological connections of technology foresight should be developed in this context:

- rearrangement of stakeholders' choice and the way of their involvement,
- giving stakeholder status to the natural environment,
- building up a technology foresight network,
- institutionalisation of technology foresight as an inner phase of technology management and governance.

The re-assessment of social function of technology foresight, under new social conditions, requires that the sphere of stakeholders should be extended to include all potential actors, e.g. scientific researchers, producers, service providers, users, managers, policy makers etc. Solving this problem is not a simple task, because the range of potential actors and their competences are also to be defined, hypothetically. *This can give additional dimensions to the matter of stakeholders' choice.* The need to find stakeholders is evident in present circumstances, but to find possible stakeholders of the future depends on the expected social function of the new technology. In this aspect the principle of representativity should be abandoned. But what would be the new criteria for the choice of stakeholders in place of representativity? To answer this question we should pay attention to the competence of potential actors. One possible

solution would consider both the competence and ability of an actor to become a stakeholder in a certain technology foresight project in such a way that demands at least a minimal level of diversity of new thoughts. Detailed methodological elaboration of this solution should be a new research topic of technology foresight.

The other new issue is *the consideration of the natural environment as a stakeholder in technology foresight*. Since technology foresight is an interactive communication process among stakeholders, issues that are not of immediate interest to stakeholders are undervalued during the communication process. The natural environment is seen as just another important issue in the area of technology foresight. The stakeholder of natural environment should be sought after from among environmental scientists/researchers and organizations. An additional methodological problem that arises is: *how and in what phase of technology foresight can the stakeholder of natural environment be involved so that his activity does not counter fresh thoughts about the development of technology*?

Applying any kind of methodologically acceptable solutions, in response to the questions raised, technology foresight can result in different conflicts among stakeholders. These conflicts may be the subject of further discussions, but may also be a valuable means for new findings in technology foresight. Bringing to light conflicting future thoughts and merging them (if possible) into different alternatives, should be regarded important in the process of reaching a 'consensus future'. Conflicts among stakeholders concerning alternative futures signal the fact that there is no consensus concerning technology future, but it can also signal that certain stakeholders' groups would like to develop an alternative technology. *Democratic societies should also make possible to seek alternative technological paths. Methodologically it is essential that every expectation concerning the future of technology should be transparent and stakeholders should take responsibility for them.*

Organization techniques also need improvement, if an increasing number of competent stakeholders are to take part in the process of technology foresight. *Networking is the preferred working method* (*Bezold*, 2006). It can be acceptable, provided that the network is open to every stakeholder who wants to join the technology foresight activity. It is the task of the foresight manager to encourage stakeholder involvement.

This means that there is no available well-founded methodology for the free involvement of stakeholders, besides the general methodology of networking. While looking for methodological solutions it is very important to emphasize that technology foresight requires – as input information – diversity of thoughts regarding technology future, and concurrent filtering through discussion by competent stakeholders. Use of the Internet is encouraged, because applying the old 'hand-made' solutions (like using experts' or public Delphi, brainstorming etc.) does not make possible the collecting and processing of all technology future ideas, without jeopardising free participation and expression of future ideas. In addition, these 'old' procedures are extremely time-consuming. The establishment of an open website for technology foresight networking is a very simple and frequently applied method for open discussion or dissemination of special issues and results. *The methodological development of its working for achieving free participation in the whole process of technology foresight is yet unsolved.* This is not fortunate, at a time when the meaning of technology foresight is also changing and the strengthening of democratic participation is an emerging new line of technology foresight. This methodological development itself could be another important foresight research project.

Strengthening of democratic participation in technology foresight cannot be achieved without responsibility for the future expectations and ethical future actions by stakeholders (*Nováky,* 2006). For this reason, technology foresight should not only become a continuous activity with regular feedbacks, but also a means of technology management and governance. Up until now, technology foresight has established close connections to policy and decision making. The present overemphasis of a 'consensus future' can be regarded as the 'price' of these close connections. If the democratisation of technology management and governance, including and technology foresight could be brought together, on the basis of development of participatory democracy, then the development of methodology of participation in technology foresight could be achieved through *cooperation between foresight professionals, working in the area of technology foresight, and professionals dealing with the development of management and governance* (*Heinelt,* 2002). This should prove to be a better way for institutionalisation of technology foresight, rather than further strengthening connections with the present form of policy and decision making.

New conditions and tasks mentioned in the area of technology foresight and special development routes for technology foresight also make possible for technology foresight to contribute more effectively to the achievement of anticipatory democracy. In view of the fact that *recommended methodological issues are not essentially in conflict with research issues/projects of other foresight activities, therefore it is recommended that technology foresight should also strengthen its connections to other areas of foresight*.

Note

1 This study is based on the presentation 'Methodological Experiences in Hungarian Foresight Activities' held at 5th workshop of the Forum 'Foresight, Roadmapping and Governance' (7-8 December 2007, Budapest) organised by Forschungszentrum Karlsruhe, Florida Institute of Technology and the Hungarian National Commission For UNESCO.

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Erzsébet Nováky, Éva Hideg

Methodological Experiences in Hungarian Foresight Activities Based on Critical Futures Studies[1]

Introductory thoughts

We are living in unstable socio-economic processes, with significant social changes occurring and decisions being made with controversial effects on the population. This time, it is not sufficient to foresee trends, given that possible futures were developed by way of studying the facts of objective reality. Neither can we consider future expectations and planned actions by key stakeholders, because the affected population may act against future conceptions and decisions that can be regarded reasonable and professionally well-founded. Therefore, we should become familiar with the views, opinions and expectations of the individuals and the population regarding the future.

People tend to realize that they need to live with their future-shaping power for the sake of their individual future, embedded in the future of their wider environment. More and more people wish to be involved and do not regret the time and energy invested. Futurists should not make decisions or evaluate observed processes on their own. Stakeholders, attentive public and opinion leaders should be involved in the foresight process. This is the reason why we are working to improve foresight procedures which opens the way to participatory approach.

We have gained substantial methodological experience in foreseeing the future for education, regional development and in the macro sphere of society. The first social foresight study prepared in Hungary for the future of education was in (1992-1994 and 1995-96) and the second one was carried out in 2006. We have elaborated public foresight procedures for regional foresight in two cases (*Tuzsér*, 2000,

Kiskunfélegyháza, 2003). We also used participatory futures study methods to look for future alternatives for Hungary, beyond tomorrow. We are of the opinion that methodological experiences thus gained can also be used in the area of technology foresight.

Foresights in the field of vocational education

In Hungary the first social foresight was prepared for the future of education and vocational training (between 1992-1994 and 1995-1996) (*Hideg, Nováky,* 1998). The foresight project was conducted and accomplished by authors of this paper. The first phase was part of a World Bank programme to develop education of Hungarian youth, while the second phase was ordered by the Hungarian National Institute of Vocational Training.

The aim of this foresight activity was to elaborate complex, long-term development alternatives for domestic vocational education. The most important stated goals were to:

- underpin development of the Hungarian system of vocational education,
- explore expectations of stakeholders of vocational education regarding the future,
- establish the position of vocational education in social future-models,
- provide possible, desirable, complex and consistent futures alternatives to policy makers and other stakeholders,
- influence policy makers towards the most desirable and affordable direction of development.

During that time, the know-how of forecasting was generally known and popular, so we started our researches as if it were a social forecast activity. *During preparatory works however, we soon realised that proceeding with the project cannot be a forecasting-type activity,* because domestic trends were changing after Hungarian political transformation (in 1998) and international trends also showed signs of shifting in education and vocational training tendencies. Consequently, we had to develop a new methodology to solve the given futures task (*Hideg, Nováky,* 1999). Under these conditions we had to reveal whether Hungarian society showed signs of change, new

thoughts, expectations and intentions that would imply modernization of the education system. We therefore asked socially determinant actors of education and vocational training how they saw the problems, possible avenues of development of the Hungarian educational system. In addition, we wanted to offer an international outlook and to include its results to the stakeholders' expectations. Therefore our attention was focused on the following three areas:

- Placing the problem in an international context, we were mainly interested in how certain well-developed countries and region, known to be spearheading even faster development of the time, defined socio-economic functions of vocational education and corresponding tasks.
- What was the position of the decisive players in Hungarian vocational education system on the problems and prospects for future development in this area?
- Were there any clear future alternatives which could be developed, based on the expectations of different stakeholders and which could be seen as local solutions of global and regional problems of vocational education?

Our study of international outlook was focused on products of futures studies, the aim of which was to describe social future-models and which concentrated on the long-term development strategy of education and vocational education. This work was done by experts of foresight in the form of study writing.

In the first phase of the project, stakeholders were given the task of studying 65 schools of vocational education which took part in the World Bank programme. School directors were asked about their ideas of development of the Hungarian vocational education, by using two-round Delphi method. It was noted that there was yet another involved and important stakeholder in vocational education, namely the Hungarian population, because people had attended, were attending or might attend school at any time. *Representatives of the Hungarian population were asked by using one-round Delphi, so-called public Delphi method. We were interested about their future orientation and the role of schooling in their life.*

The second phase of this foresight activity was carried out in terms of extending the circle of stakeholders and deepening vision of possible future alternatives for

developing Hungarian vocational education. In the second phase, selected circles of stakeholders were as:

- schools involved in vocational education as providers of school service,
- children participating in vocational education as students,
- parents directly associated with some form of vocational education, whose decision and expectation influence the schooling of youth,
- employers, as 'consumers' of vocational education, who require qualified workers in their working process.

That foresight activity was extended to include the whole Hungarian society therefore the involvement of stakeholders was carried out through their representatives. The method used was the one-round Delphi. Our hypotheses, that (1)each group of stakeholders was competent in different scope if issues, (2) valuable information could be gained about the Hungarian society and economy (as the environment of vocational education), about social functions and possible systems of vocational education, if different questions were put to the different types of stakeholders and, (3) stakeholder involvement was achieved in different ways, which in time proved to be correct, on the basis of historical valuation of future alternatives of vocational education, elaborated during that foresight activity which is still under discussion.

After surveying opinions and expectations of stakeholders, comparative and consistence analyses were carried out by foresight experts. The aim of consistence analysis was to fit the valuations of situation (given at the time) as problems and expectations regarding the future of that time as possible problem solutions for vocational education to one another, also with a view to results of international outlook.

Futures workshop technique was applied in Hungary, firstly in foresight activity. In the first phase a futures workshop was held with the participation of so-called 'World Bank schools'. The results of stakeholders' workshop were feed-backed to the futurists' workshop for using additional future information in the development of future alternatives concerning Hungarian vocational education (*Hideg, Kappéter, Nováky*, 1995).

In the second phase, even more workshops were held, because more stakeholders were involved in the foresight procedure. The results of experts' and stakeholders' workshops were also feed-backed to the futurists' workshop to finalize the two possible development alternatives regarding the education and vocational education system in Hungary (*Hideg, Nováky,* 1998).

The second social foresight activity in the field of vocational education was organised for the elaborating the idea of setting up a network of regional vocational examination centres in Hungary. It was carried out in 2006 on behalf of National Vocational Training Institute[2] (*Bartus, Hideg eds.*, 2007). The foresight project was led and accomplished by Éva Hideg.

The purpose of this foresight activity was to work out future ideas for a network of regional vocational examination centres, their possible establishment and forms of professional operation in terms of prevalent and future domestic conditions; including social acceptability and/or eligibility for support for the 2007-2013 period. The proposal for the establishment of the regional examination centres was based on research conducted in the following topics:

- The shared points of development paths of Hungarian and European Union societies and economies and the resulting considerations;
- Experiences of reforms with comparable objectives and subjects undertaken in other European Union Member States;
- The statistical and critical analyses of Hungarian vocational examination practice in the period 2000-2005;
- The ideas of stakeholders of vocational examination practice, such as examining teachers, examination board chairs, regional training centres, chambers of commerce, industry and agriculture, representative associations of employers, working to improve and develop the current examination system.

Research of the first three topics mentioned was carried out by experts through making analysis and development studies. Exploration of future conceptions of key stakeholders of vocational examination practice at that time was made by directed study writing. Some questions were put and while answering them, stakeholders could express their

views and expectations about the present and future system of vocational examination. *The stakeholders could answer freely because the questions provided only the framework for their answers. The content of answers was not influenced and the length of answers was also not limited.*

We were unable to involve all important stakeholders, due to the limited time available for the research. The research did not extend to the opinions and ideas of examinees and persons ordering examinations. Our view is that they should be involved at the stage where professionally justified ideas have already been mapped out. One of the ways that this can be ensured – apart from publishing the results of the research – is to hold workshops for the various groups of examinees and future examinees, where the various vocational examination centre ideas and the models of their potential feasibility and operation would be presented and participants could try these models and express what they would accept and what they would want to change and why. In addition to these live workshops it would also be expedient to create an interactive online website for a limited period to ensure that the opinions and suggestions of the widest possible spectrum of citizens is taken into account during the transformation of the vocational examination system. Our position is that the involvement of those at the receiving end of vocational examination services could play an important role in the utilization of research results, e.g. during the process of detailed planning and/or a pilot programme.

We have gathered a total of seven different regional examination system concepts from the ideas presented by the stakeholders concerned. After gathering the opinions and expectations of stakeholders, a number of different filters were used to tone down the subjectivity of stakeholders. *These filters included comparative and consistence analyses, professional workshops with different compositions and number of participants.* After filtering we utilized these ideas during our synthesis work by aligning the ideas of the stakeholders to the views on the environment and the system of expectations gathered by studying the first three topics referred to above. That is why the final concept does not fully correspond to any of the ideas put forward by the stakeholders. Another reason for this is that within the various ideas of the stakeholders we strove to find

- common cores and elements,

- those shared points in terms of which the various ideas can complement, enrich one another, and

- possible sources of conflict, which must be resolved by finding possible modes of resolution in the course of our synthesis work.

The guiding principle of synthesis work was to define and interpret vocational examination in a manner that is professionally well-grounded and can aid the development of domestic practice and to draw up the new institutional concept, the main functions of operation, the possible framework and feasibility of operation in line therewith.

Workshops were the most definitive forms of synthesis work. We have developed the concept of the new vocational examination centre network during these synthesis workshops. In addition, we have also identified the larger issues, where we have encountered diverging interpretations and have found an interpretative framework, which allows us to handle and answer questions in a manner that fits into a consistent system. One of the most significant tasks to be achieved during the workshops was to draw up alternative proposals for feasibility, estimation of material, labour and infrastructural requirements, as well as envisaged costs of implementation.

The concept and implementation ideas of the regional vocational examination network emerged through a series of workshops where participants were representatives of key stakeholders as experts of vocational examination, representatives of economic chambers, the representative of National Institute of Vocational Education and the leader of this foresight activity. Results of these series of workshop were sent to a larger group of experts and stakeholders as a working document, who then proceeded to work on the concept and possible modes and forms of implementation within the framework of a one-day discussion and workshop. *Participants of the wider scope one-day discussion and workshop were representatives of would-be stakeholders as trade unions, multinational and national enterprises, the Confederation of Hungarian Employers and Industrialists and representatives of the Labour Ministry as authority, besides representatives of key stakeholders mentioned.* The main reason of involvement of extra stakeholders was that the outcome of the series of workshops, according to which the circle of actors of vocational examination system should be expanded in the

future so that vocational examination can serve better people' adaptation to labour needs and life-long learning.

We have also taken into account critical observations and proposals for further development, made at the wider scope one-day discussion and workshop. The synthesis study, the result of this foresight procedure, was primarily based on the experts' studies, discussed, filtered and feed-backed future ideas of stakeholders, the outcomes of synthesis workshops and the wider scope one-day discussion and workshop in this way. *A 'consensus future' has not emerged because of conflicting interests among different stakeholders (especially between the economic chambers and other stakeholders) but three future alternatives have taken shape.*

Public foresight for regional foresights

The future of Tuzsér village and the small region of Felső-Szabolcs

The research was carried out in 2000, using public Delphi (*Nováky*, 2000). Participants were from Tuzsér (a small village in North-East Hungary, in a not so rich region) and people who are somehow related and feel responsible for the future of this region. The first round of the surveys mapped topics of the future that the participants thought responsibly about, and changes they thought would define the future of the region. The second round investigated what the possibilities were for development, and their expected time-horizon. The time-horizons were 1998-2002, 2003-2010, 2011-2025, 2026-2050, after 2050 and never. The intervals are widening with a view to neutralize growing instability. The third round, based on the results of the second round, examined events that were anticipated in each time-horizon and what the expected order of the events could be.

In the first round participants mentioned changes, referring to actual trends (e.g. education in the elementary school has a focus on environment protection) and weak signals (e.g. Tuzsér becomes a conference centre). The appearance, evolving and strengthening in the future of the top-down (e.g. development of vehicle traffic) and the bottom-up (e.g. cooperation of local communities) processes could be observed from the answers. The changes can be grouped according to their most important effect, such

as economic, social, technological or environmental relevance. According to the answers, most of the events would possibly happen in the between the years 2003-2010. Two subjects regarded as 'never to happen' and 'the present situation would never change'; these were the kind of events participants were very much concerned about and thus they would not change without external initiation. These two critical questions were: ethnical conflicts and the development of the local bus transport; participants could not imagine that a turning point could come, so professionals' mediation is required.

Societal changes were considered to happen later than the economic ones: this is an acceptable and normal phenomenon, considering different time requirements of these processes. In environmental and technological topics people were very open to the changes, and they were willing to act for them, even though in some cases of external determination they were sceptical. About changes that were visible, appreciable and known they thought to happen relatively early and they seemed ready to act for them. Consequently, they were willing to take action for changes they can see the outcome of, but for processes of long-term result or long-term effect they were not so committed. Hence decision-makers, professionals and futurists have indispensable responsibility for the future, splitting the long-term projects into smaller cases and objectives, making them more familiar and accessible.

Events of unstable outcome in the questionnaire (e.g. nearly similar possibilities in two different and far time-periods) offered the alternatives for the future. Three alternatives could be created, regarding the focus of development: economic, societal and economic-societal. In the first alternative *the economic development* is in the spotlight, that later will cause the societal recovery. This carries the risk of inefficiency and increases the possibility of unwelcome developments in the small region. If the *development of societal processes* is significant, it will be based on modernisation, like expanding the Internet for education or communication purposes. In this case the unstable factor that threatens accomplishment is an ethnical conflict, which should be resolved. In the third alternative *societal and economic processes are strengthening each other*, but only in case that the system has a positive feedback, creating new possibilities and these changes have positive effects. The future orientation and responsibility of decision makers and the stakeholders is required to this end (*Nováky*, 2007). People are open to

implement changes they are motivated for. To advance long-term changes, people have to be conscious about their possibilities, and also be aware that long-term future will come eventually, and we have to prepare for it in the present.

The future of the Hungarian town Kiskunfélegyháza

Kiskunfélegyháza is a small town in Southern Hungary. Its future was studied, based on its population's expectations until the year 2020, with the aspect of substantiating the development plans of the town. The research (*Nováky*, 2003) concluded that dealing with the future has become more important, the future belonged to everyone, so everyone should be involved in designing the future. Inhabitants' opinion was collected with a three-round public Delphi method. The three aspects of the questions were the following: (1) external processes that influence the town's societal-economic development, (2) forces inherent in the local management and the civil communities' and (3) townspeople's expectations of the future. The examined intervals were: until 2005, between the years 2005-2010 and 2010-2020, and after 2020 and never.

The results of the first round show that inhabitants were not particularly innovative, they were interested about the future just to break away from the present. Despite this, their thoughts about the world were complex and coherent. People were the most undecided about the factors on world economics, on the EU and on the labour force. The majority thought that most of the events and changes would happen between 2005 and 2020. They thought that local management is not sufficiently innovative or creative. They agreed that the role of civil movements/communities was important, but the relationship with the local governance is not successful yet, thus it should be developed. At the end of the third round it became clear that they were very uncertain in a lot of questions. One of the uncertainties was linked to Hungary's joining of the European Union. The research took place before our EU membership, so people could not know what to expect from it, what effects it would have. Some favourable events, like the increasing protection of the environment, job creation or canalisation, were considered to happen in the distant future. This vast instability means that they did not trust the positive influence of certain processes, and this ultimately leads to inactivity.

With some answers the participants foresighted the situation of not only Kiskunfélegyháza, but of the whole country, like how development projects fell through, despite given possibilities. We now know that in present-day Hungary we are not able to benefit from various opportunities, economic growth is slow and funds from the EU-tenders are not allocated well. Many answers alluded to this, even though we were two years from joining the EU and that time the only factor that could turn the climate of opinion optimistic about Hungary's EU membership were the high expectations about possible EU support.

Alternative scenarios were designed for the future of Kiskunfélegyháza, based on the evaluation of instability and possibilities: like expectations about reliance or fear and whether possibilities are appreciated or depreciated. The four alternatives are: 'Successful Future', 'Pusillanimity', 'Confidence' and 'Unhappy Future'.

The '*Successful Future'* turns true, if the development does not run into any material or personal obstacles; a preferable scenario. Expectations filled with fear, hinder the development in the case of '*Pusillanimity'*, but it can be avoided with a strong guidance that overcomes fear and strengthens favourable processes. Its advantage is its risk as well: a pusillanimous community can be easily led and used. If '*Confidence'* rules a community the way out from depreciated possibilities is conscious future orientation, which can open up new possibilities to for development. In an '*Unhappy Future'* attitude, local development options can fail due to inadequate guidance, illusory expectations about EU or other funds, moreover there is no constructive relationship between the town governance and the population to resolve this situation.

These alternatives are simplified visions of the future and a mixture of these could probably come true. A common feature is that the decision makers have two tasks: examination of the stability of processes, to see clearly which ones could be changed and which ones are the most sensitive; to shape and making real and conscious the future-designing forces and expand the studies of future orientation and improve the future-consciousness on this basis. Without these activities the expected development will not be successful or it will take more time. But communities and the future cannot wait and we have to take actions in the present!

Looking for future alternatives for Hungary beyond tomorrow, by using participatory futures studies methods

This is the third long-term future image for Hungary, completed in the year 2000. The first one was constructed in the early 1970s, focused on the NNP per capita with top-down approach. The second complex future image, of the mid-1980s, concentrated on individual necessities. The third future image of Hungary is the study '*Hungary beyond tomorrow'* (*Nováky* e*d*., 2001). Its aim is to find acceptable alternatives for the future, instead of finding and shaping the most probable future. In the study more methods are used and the results are presented with scenario building, because some facts were evident: the emerging and differentiating future orientation of individuals, societal institutions and enterprises; the observation of many seeds of change in the present; and generally the feeling of the unstable circumstances. The approach is dynamic and complex, offering the possibility to top-down and bottom-up observations.

We know from previous examinations of future orientation (*Nováky*, *Hideg*, *Kappéter, 1994*, *Hideg*, *Nováky*, *1998*) that in the 1990s people's future orientation had practical reasons: the main goal of the activities was to assure the right future for the family and the children, plus to organize the work rationally. Participants did not perceive that hard work and other activities was the source of qualitative changes, because they thought it was difficult to cope with the circumstances. The future of enterprise orientation is filled with fear, and enterprises are thinking and doing very little about the future. Consequently, the economic situation and its factors were analysed in 'Hungary beyond tomorrow'.

Different future alternatives were formulated, according to the possibilities of political and economic (Hungary and the global world) development. These scenarios or versions of the future are not based on trends, but on future possibilities, built upon alternativity and instability-based bifurcations. Eight versions of the future were developed: all of them were possible, but not all were acceptable for society. The eight versions were examined from three other aspects to highlight the question of acceptance and support: expectations of joining the EU, changes in values and individual aspirations. Hungary's EU membership divided the population therefore people's relation to the eight versions was not homogenous: hope, pragmatism, ability and

disability were the four groups that could be identified. From changes in values another four groups were created, based on the idea that similar values were important for somebody: new consumer values with varying life-styles; environment-friendly values; peace, security of the family, happiness and material welfare; trustworthy, responsible, brave, rational and helpful values. People with different values could accept and support different versions of the future (*Masini*, 1994). Individual aspirations as the third aspect could be the future of the family and of the children; influencing the future; 'space-age' perspective; education and work in the future. The eight versions of the future were filtered through these three aspect groups, and it emerged that two of the versions (the 2nd and 7th) were acceptable from some aspects, while everyone was ready to accept one of the eight versions (the 1st). This latter one is a future, based on regional integration, on economic policy with prominence national interests and on balanced development within the European Union. To reduce the high number of versions, another two aspects were introduced: possibilities, thence stability or instability of the processes and the environment, and expectations that favour changes or not.

In the first alternative, possibilities and expectations are in balance, they are both stable, so it causes idleness and postponing actions and changes. In Hungarian we call this the '*Pató Pál-effect'*, which is similar to the Spanish '*Mañana'*: i.e. leave everything for tomorrow. The second alternative contains '*the societal claim for change'* that typically generates revolution, without unstable processes, like it happened in Hungary in1848 and in 1956. The third alternative offers the possibility of change, but with the lack of interest surrounding it (due to unfulfilled possibilities and fear of change) – after a while this future can be termed '*the ship has sailed off*'. In the fourth alternative, Hungary is ready to make favourable changes and societal expectations – '*the winner takes it all'*!

The 2nd and 7th versions, that were termed as 'partly acceptable' for everyone were collateral with the fourth alternative (possibility of big changes), while the 1st version, that everyone could accept, was part of the second alternative (where processes and the environment need to be changed). As a consequence we can state that the ability of innovation and the presence of future designing forces are definitely necessary for reaching a breakthrough.

Today we are aware that expectations connected to EU membership were too high, and activity was lacking to make changes happen. The study on 'Hungary beyond tomorrow' projected this drawback. The only way to change the future is to think about it, then take action for it. The activities can be followed by expectations, but expectations without action will not change anything.

Methodological experiences for technology foresight

We are of the view that our methodological experience gained while leading social foresight activity can also be applicable in the field of technology foresight. Technology foresight consists not only of a list of new possible scientific solutions, embedded in technology novelty, but also of new socio-economic relations to technology and its development and human acceptance of possible new technology. The latter two relations are of particular importance if technology foresight is carried out. Human relations to technology foresight could be strengthened by taking into consideration of our methodological experiences.

1. In social foresight projects discussed, working with participatory tools developed in critical futures studies were preferred to *involve stakeholders, including non-professionals as well, and to integrate their future expectations into the future shaping process*. The main aim of methodological solutions thus developed was to produce synergy between future thoughts and expectations of professional and non-professional stakeholders.
2. *Stakeholders* have different ideas and expectations depending on their future orientation and position in the system, *their future is the object of foresight*. Their ideas and expectations constitute building blocks in foresight activity and vice versa the ideas and expectation of stakeholders develop by participation in foresight activity.
3. Given that stakeholders are competent in different scope of issues therefore *their involvement in the foresight procedure should be achieved in different ways depending on the aim, task and object of foresight activity*.
4. Important are not only the typical future thoughts of stakeholders, but also the extreme ones, if they can become the object of discussion and generate new future alternatives during the process. Therefore, *maintaining the right and*

possibility of freedom of speech and free expression of opinion, is the focal point of the whole foresight procedure.

5. Both direct and indirect subjective methods should be used for exploring, generating and applying future thoughts of stakeholders.
6. Comparative analysis of futures ideas and expectations opens the way to look for consistency and inconsistency among stakeholders' opinions. *Dialogue among stakeholders can serve both consensus building and mapping of future alternatives.*
7. *Futures workshops help to highlight potential conflicts among stakeholders* that can ultimately lead forward to another trajectory, which is different from the present one.
8. Neither scientific experts nor futurists are able to find out or invent the future, but they can contribute to outlining the framework of possible futures.
9. *Dialogue between scientific experts and different stakeholders, also helps to bridge distances between scientific and practical knowledge about the future.*
10. *Dialogue has proved to be a useful means to generate reflexive learning and knowledge production regarding the future.*
11. Methodology and methods used are also dependent on the aim and object of foresight. *There is not one good foresight procedure and combination of methods for all purposes.*
12. *Search for further opportunities of stakeholder participation in foresight activity, should be an important research topic for futurists.*
13. *Laymen are mature enough to articulate their opinions and their future expectations, while futurists, using the tools of academic futures studies, can open the process and involve them in helping to develop future alternatives and foresight specialists.*

Notes

1 This study is based on the presentation 'Methodological Experiences in Hungarian Foresight Activities' held at 5th workshop of the Forum 'Foresight, Roadmapping and Governance' (7-8 December 2007, Budapest) organised by Forschungszentrum Karlsruhe, Florida Institute of Technology and the Hungarian National Commission For UNESCO.

2 The name of this institute has been changed. The National Institute of Vocational and Adult Education is the legal successor of the National Institute of Vocational Education from the beginning of the year 2007.

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When Online Models Cross Real-Time Inquiry on Early Forms of Change

Introduction

In our world deep changes have been affecting different areas of complex society, values and our relationship to them for more than a decade in Hungary. Changes are not only 'happen' to us, but also – due to the democratic system change and increasing instability – we have the opportunity to form the changes according to our goals and values. For this we must constantly track the changes and signals of change within our environment.

New information technique provides new conditions, which we might and should live with. We have to constantly track, interpret, analyse and evaluate information might signal changes and draw conclusions from them towards the future i.e. to construct different futures. Conclusions and expectations should not only be conceived to just one area and topic. Transforming and restructuring interrelationships among different fields and topics must be tracked constantly. Therefore it is necessary to focus on the future images again, as we might interpret and evaluate different changes in tendencies and signals of change relating one another. However, this kind of future image building does not mean the formulation of a distant, desirable future image, but a permanently updated complex set of future variants and future image alternatives, which are ambiguous from the aspect of our possibilities as well as our goals, values and activity intentions. Furthermore they depend on, how other social actors relate to their opportunities, and future shaping activities.

In an unstable period we have to carry out these analyses and produce forecast and foresight information applying new procedure and also methods quite different from

older ones, along with making the process constant and rapid. Moreover it is essential and desirable that re-constructed future images should form the basis for activities of individual and institutional foresight, and the procedures of online future image re-construction might be applied to test individual and community foresight as well.

Based on the results of our earlier researches (*Nováky ed.*, 2001, *Hideg ed.*, 2001) in our paper we would like to show:

- how it is possible to permanently refresh Hungarian future images within the environment of information technology,
- how we might explore, perceive changes or their signals and determine the possible fields of change and give meaning them, or construct from them emergent social possibilities amid the circumstances of constant instability and changes.

Methodological considerations

There are many reasons for re-construction of a future image in a new way. We focus on only one main reason, namely whether changes can be happened in the future (in the objective tendencies) and/or our future conception/meaning (i.e. subjective judgements) is changing or not.

What we do not suggest?

If we approach to the future exclusively in a subjective way, we would intend to outline either the desirable future, or anticipate only catastrophic situations exaggerating threats and dangers. If we conceptualize the future as a set of desirable alternatives, we would intend to see only the favourable part of it. So we exclude the non-desirable alternatives. If we interpret the future as a series of negative situations, we would have to go without recording desirable alternatives (*FOR-LEARN project, Miles*, 1997). Approaching to the future only by subjective foundations means that we disregard the objective characteristics of unfolding processes.

However, if we approach to the future in an objective way, exclusively focussing on presence and continuation of processes, then subjective point of view will be de-

emphasized. If we concentrate only on objectively emerging phenomena, which we see with high probability, then we might get into the trouble that we only seek the most probable future variant. In this case we conceptualize forecast as prediction, and we exclude the less probable variants.

Concentrating on subjective hopes or objective factors might in itself lead to a wrong way, as it restricts the set of future variants/alternatives. On the fertile ground of instability, when the future might unfold in many ways, this approach is not right. Therefore nowadays it is not reasonable to draw only desirable future images or catastrophic situations, and there is no room to predict the probable future (*Hideg,* 2002, *Skumanich, Silbernagel,* 1997).

What we suggest?

In our world with numerous changes we have to think in another way. We should not see just the desirable future, but we have to face non-favourable ones as well. We should not foresee only the well interpretable future unfolding from the past with high probability, but also uncertain, not yet formed futures, having weak signals, but which can turn up as possible alternatives, and can later be realized as a consequence of human future-shaping factors (*Inayatullah*, 2000).

It should be cleared that objective processes and human sphere might change as an effect of external and internal (self-organizing) forces as well, and these changes interrelate with one another. As a result of them new situations might come to pass, which are relatively difficult to 'hold in hand'. Therefore it is necessary to recognize, whether processes have changing capability, and if so, then what kind. At the same time we have to be aware of the possibility to intervene into the processes, i.e. whether human actions might change the flow of examined processes, and if so, then which activities of certain social groups play an important role within this (*Inayatullah,* 2002).

Hence, at present times it is reasonable to examine first whether process are formable and changeable (i.e. whether they sensitively react to impacts, especially to small impacts), and second what future-shaping capability and power the individual and institutional human sphere with different values has (*Slaughter,* 2004). Examining

consequently the stability/instability of processes and the future orientation of individuals and institutions is of great importance.

In our unstable world the question is not only, where we might go (on the level of recognized possibilities), but also where we should go (taking into account objectives and expectations) (*Slaughter*, 2004). Alternative characteristics of eternal objective and their elaboration are increasing, as there is an opportunity to move towards different directions in the era of high uncertainties. Relationship between objectives, future possibilities, future images and paths towards them must be drawn in a way quite different from the past. This has to be done in an idiosyncratic situation, on the ground of permanent transformation, when neither future images, nor direction of change could characteristically be outlined. Recognizing and managing changes, however, might help to establish development directions to societies and economies, and to seek desirable, or at least still acceptable development paths (*Nováky ed.*, 2001).

Amid present unstable circumstances we cannot construct either a theoretically underpinned, desirable or the most probable future image. In our world with deep changes we might only think in future images, future alternatives capable of adapting to changing conditions, ourselves and values. Continuous and up-to-date elaboration of them is a challenging job, however today we are able to tackle this problem (*Karp*, 2004). We might only rule processes and changes, if we recognize, how deep and in what directions they might change, or they simply show arbitrary fluctuations. Recognizing the possibility of changes we might consider the form of intervention and alteration.

Possible future images and future alternatives might effectively be explored following a two-way approach: we examine first the stability/instability of processes and changes, second the future orientation of individuals and social institutions as social filters (*Nováky ed.,* 2001). Elements of the two-way approach should naturally be linked in an interrelated way to provide information underpinning strategy.

Arising future images, i.e. future image alternatives should meet the expectations and challenges of the future, and the changes of the values, value systems. Therefore it is essential to somehow link economic competitiveness with social security, to mutually

interpret economic growth, social innovation, together with social, community level, institutional and individual adaptation in case of all future alternatives. Acceptability of future image alternatives draws the criterion that they should provide development latitude to society and its members, so they have to inspire individual and community level foresight, and enable to form and to move on different development paths.

Following the traditional way of thinking and methods of futures studies we might get only to a narrow set of future alternatives. Renewed futures studies methodology and methods, however, enables to give adequate foresight on the basis of practical futures studies and new scientific results. According to our researches general evolutionary theory and chaos theory might provide the two new theoretical-methodological frameworks, on the basis of which new kinds of responses might be given to emerging questions quite different from the past (*Nováky ed.,* 1995, *Hideg ed.,* 2001, *Hideg*, 2006). General evolutionary theory might verbally show the transformation from stability to instability, the emerging bifurcation mechanisms and the range of possible futures. It might help to answer, what kind of evolutionary possibilities and patterns of the future be explored and presented among complexities including subjectivity. Chaos theory is able to tackle chaotic behaviour derived from instability, together with its consequences. It provides the key to explore evolutionary paths and helps to answer whether a time series behaves stable or unstable. Sketching new emerging situations amid instability not only facilitates clearity among the variety of possible future paths, but also systematically generates them applying idiosyncratic quantitative methods. Chaos theory is significant, as it assists to identify conditions, among which the future state of the examined system cannot be followed in the traditional way. It might also help to recognize, how chaotic behaviour might be directed into a seemingly stable path. The subject of future image is seen as a complex emerging social system (*Sawyer*, 2005) whose future cannot be forecasted but the fields of its change can be explored, the signals and early forms of social change and possible consequences of their cross impacts can be meant and constructed in this way.

We are aware of that the objective-way approach is not purely objective: it is also weighted by human meaning. Similarly, the subjective-way approach carries in itself the impacts of outer worlds as well. Therefore our aim is to intertwine these two exaggerative approaches with one other in the process of shaping future images and in

the environment of information technology. This context makes possible to interpret the future in a dialectic way (*Fuchs, Hofkircher, Klauninger,* 2002) and formulate a new, more direct relationship with it in the practice. Society – actors, stakeholders, individuals – plays more and more important role in shaping the future (*Hoffman,* 1993), hence *we interpret the social future not only as a consequence of the past and the present, but that is shaped or constructed by social entities' actions. New individual and institutional values and expectations, as seeds of change, are reflected in future alternatives, which make the permanent maintenance and refreshment essential.*

Re-creation of future images that can be updated – providing information basis

Online application of procedures and methods enables to provide information about the future rapidly and easily, test possible consequences of different expectations for the future, and store and reuse future information, future images in the framework of different foresight and educational activities. We organized our researches and selected methods in accordance with these methodological fundamentals. Our methods are interesting not in themselves, but in their interlinked and online application.

Steps of research activity

During our researches we first determined the information basis, the application of which would guarantee the achievement of our goals, i.e. a wide variety of future image alternatives might be constructed, and the set of information is relevant both for strategy formulation and changing future orientation purposes. Furthermore it was important to make information available in qualitative and quantitative forms, the latter also as online database. At the same time we wanted to have not only these information in the database, but a more wide range, as our imagination involved that this information basis should be able to form multiple future image alternatives following other aspects (*Nováky,* 2006).

Establishing online analytical, forecast and foresight information we laid emphasis on the stability-examination of selected time-series. We carried out the examinations not only relating to historical data, but also to the extrapolations of different trendfunctions, taking into account, how the data-series might behave in terms of stability assuming

different expectations. The choice of development functions were expanded by nonlinear difference equations, as they play an important role in the stability-examination. *This kind of stability-examination might answer the question, whether and how the trend can change, if new, future data are built into the data-series.*

Our other analytical-forecast examination was directed to explore possible relationships and their stability between information with different features, i.e. to what extent the data is sensitive, and how they might change time by time.

We analyzed relationships not only on the basis of data available in the database, *but we also collected actual information on future orientation of Hungarian society in the framework of an online survey. The results were feeded back into the database and applied during the creation of future images alternatives. On the occasion of refreshment – the re-creation of futures images alternatives – all the procedure needs to repeat.*

The role of World in Figures

To carry out analytical and foresight examinations we used *'World in Figures'* (WiF) (*Vág, Hideg*, 2004). 'World in Figures' is an online system of statistical databases extended with a couple of basic and advanced analyzing tools. This online knowledge-base with direct access to a great amount of numerical data is a gateway to an integrated statistical database containing global, country and sub-country level information. *The instruments and techniques of WiF help the user to discover associations between variables and manage 'what-if' type questions related to socio-economic development, environment, governance and human behaviour.* With its wide scope, the project provides a solid background to describe possible future alternatives.

The innovation of WiF can be described as (1) a wide range of data about different fields of life; (2) thousands of variables and millions of records available; (3) immediate access to results; (4) online statistical modules; and (5) advanced output to show or download the results. Apart from the data access, it offers modelling options, too. The online analyzer has basic and advanced functions, it contains data presentation and visualization modules, forecasting functions and downloading options. Data access is

free, except for some research and business statistics. Moreover: the user can find specific time series and methodological descriptions of the variables as well. WiF helps researchers, analysts and futurists in the field of science, education or business, with a new and effective online service, which facilitates the understanding of human life, accelerates the discovery of hidden causal relationships etc.

WiF shows signs of integrating the 'traditional' variable-based analyses with some new modelling tools, like chaos models or multi-agent-models. Additionally, it contributes to the creation of a 'floating' modelling philosophy, which is the option of flexible selection of analytical and simulation tools, depending on the problem. *A modelling tool of that kind implies high level of interactivity.* This approach provides further opportunities, for example the access to the results by the large audience. *Interactivity facilitates the permanent development of WiF project, e.g. with data supply and discussions. In this way 'floating' philosophy can be seen as a new synthesis of different modelling methods.*

The Demo Modelling Tool of WiF provides an easy to understand presentation of the tool. It is developed for online model construction. (See link to Demo models at WiF homepage (WiF) and Figure 1.)

The online model builder and data analyzer of WiF, is a JAVA application and it is integrated with a statistical data browser. To illustrate the functionality of the online analyzer and forecaster, a dialog panel of it is shown in Figure 2.

Figure 1. **The display of WiFs online model-building tool**

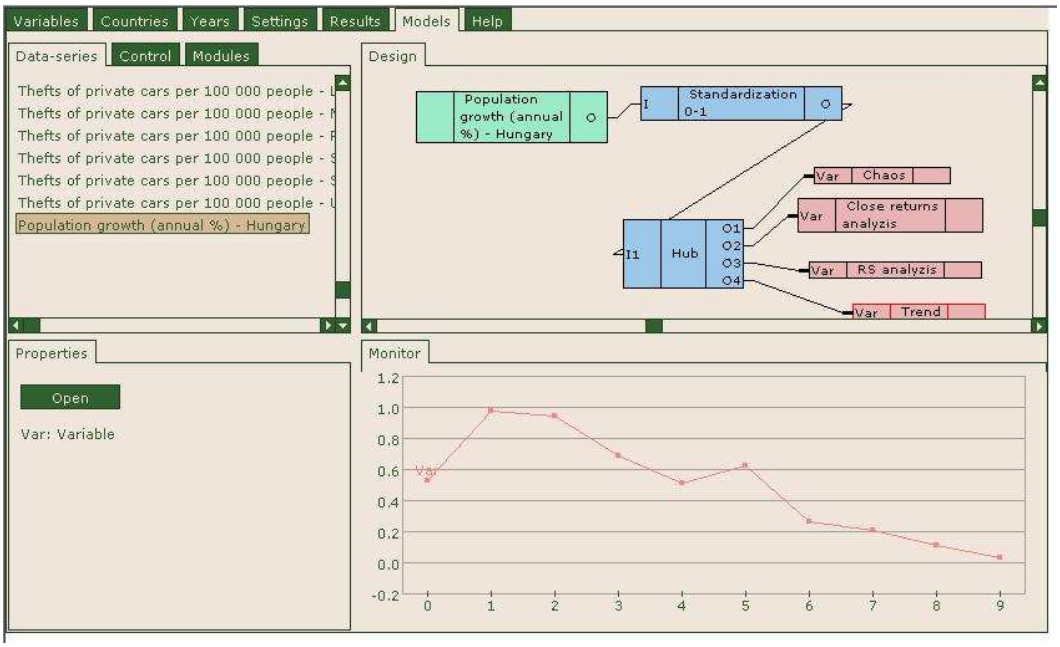
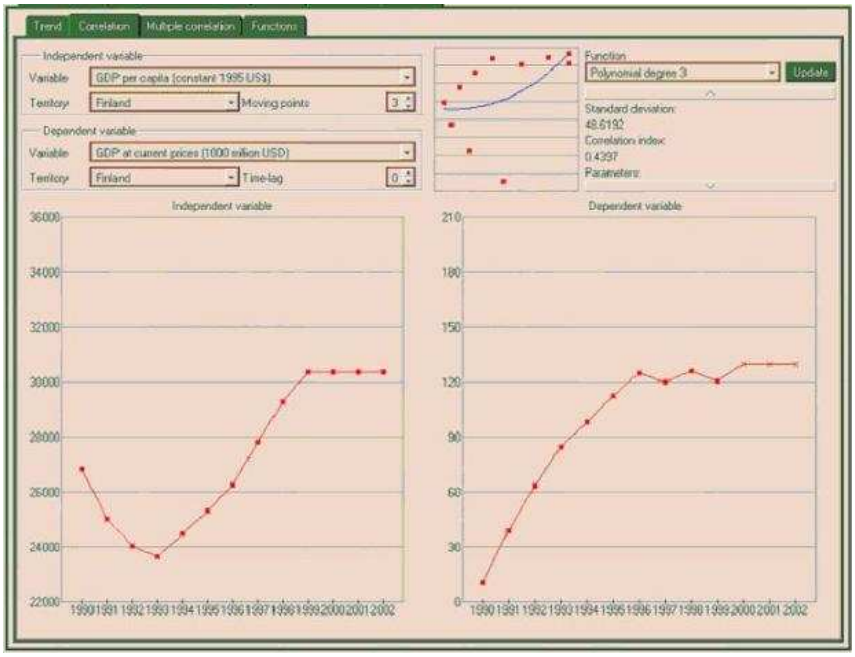


Figure 2. **A dialog window of WiF's statistical data analyzer**



The re-creation of the Hungarian future image

The aim of re-creation was to highlight the changing possibilities and expectations about futures of Hungary until 2010. For this purpose we wanted to collect future

related information both in subjective and objective ways. We also managed the interconnection of these two kinds of data. Future related opinions and expectations were gathered, e.g. (1) life conditions, (2) social inaqualities, (3) economy and (4) the sustainable development in Hungary, via an online survey. The survey sample consisted of leading Hungarian opinion shaping groups, like journalists, university teachers, scientists, company leaders, etc. The survey topics were extended with data and models of WiF. Some of the analyzed indicators were as follows:

- computers (per 1,000 people)
- Internet hosts (per 10,000 people)
- yearly growth of gross value added at market prices as % of previous year
- GDP per capita in PPP, in international USD (million USD)
- price indices of consumer products and services
- unemployment rate (%)
- average gross earnings of employees in industry and services, total (ECU/month)
- thefts of private cars per 100,000 people
- LIS Inequality Indices (gini)
- population growth (annual%)
- life expectancy at birth (years)
- GDP per unit of energy use (PPP USD per kg of oil equivalent)
- emission of carbon dioxide (metric tons per capita)
- production of renewable energy, as share of total production of primary energy

The time series of the above indicators were online analysed in the aspect of stability/instability.

Results of time series' stability-analyses and views of opinion forming groups were processed in the framework of an expertial foresight workshop. During this workshop making interconneciton of future information of two types and giving meanings of them were carried out. In the workshop we examined

- in which fields changes are expected,

- what kind of changes are possible, if we simultaneously take into account instability of trends and different views of opinion forming groups,
- how different and possible changes might associated with each other, and
- what kind of complex future image alternatives might be considered from them for the next 5 years.

Fields of change

Seeds of change were sought in unstable trends, and in different future imaginations together with their relationships of university students and active white-collars (opinion forming groups) being committed towards the future. *Changes are mostly expected in areas where trends are unstable, and at the same time future imaginations significantly differ from one another.* Nature of changes were concluded from subjective future attitudes, possible actions derived from expectations and value content of expectations. If we found relationship between trend-stability and significantly different future expectations, we regarded the possibility and characteristics of changes as unstable or uncertain that could generate social conflicts.

Trends of social and economic indicators, distribution of information techniques and technologies, population number, social inequalities and deviances show stability. In the next 5 years further spread of information techniques and technologies is expected, at the same time other social and economic processes have stable negative tendency. Indicators of expected lifetime, unemployment, economic growth, real wages, inflation, raw material- and energy request show the signs of instability.

Future expectations of opinion forming groups are similar in the sense that information techniques and technologies are continue to spread to a greater extent, domestic population number decreases further, the role of local communities will grow and environmental awareness will become better in people’s behaviour.

Different dominant opinions were formed by university students under 25 and white-collars between 26-40 in the fields of increasing living standards, decreasing social inequalities, economic growth and inflation. University students under 25

unambiguously expect further worsening in these fields, whereas white-collars between 26-40 look forward to positive changes.

However, students under 25 are more optimistic in environmental issues. They hope and expect a significantly growing domestic use of wind energy and alternative firing material in the next 5 years. At the same time they rely on politicians to a smaller extent in increasing environmental awareness than white-collars between 26-40.

Uncertainty appears in one field. Convergence of domestic wages to EU average is not underpinned by analysed indicators to the manner that opinion forming groups expected.

Trend instabilities and different subjective imaginations per age-groups appear in the same fields. They show that Hungarian society and economy is still in the transformational period began at the time of political system change. The transformational direction is information society, however, its human quality and economic productivity is still in an unfolding form and is expected to stay in the next 5 years. Seeds of change in the next 5 years are mostly available in human factors and attitudes represented by the age-group of 26-40. Unfortunately age-group under 25 does not see the chance that positive changes might go forth in domestic society and economy. If socio-economic indicators decrease at a high measure, then they might not only meet with pessimist attitudes of the age-group of under 25, but generate dispare and open social conflicts as well. It is positive, however, that they represent more environmental-aware values than the older generation. From the attitude of long-term future this is a favourable human factor and source of change.

Re-created image alternatives – Hungary in 2010

Hungary accessed to a regional integration, the countries of which have higher development level. Their economies grow slower, while their welfare system and attitude to natural environment is to be changed or amended. *Outlooks of domestic economic growth are not stable. It is probable that we cannot achieve a stable growing trajectory in the next 5 years, unless positive external impulses affect domestic economy.* These external resources might also come from different EU funds.

Domestic inflation and unemployment is not expected to have a decreasing tendency in the near future. Social inequalities will increase further, while population number will decrease and life expectancy will surely not rise unbroken. We cannot significantly reduce our development gap. Opinions and expectations expressed in the questionnaire to moderate wage-differences between Hungary and EU countries is not underpinned by data and changes concluded from them.

The future of our environmental charging depends on economic growth and environmental intensity of economic development. If economic growth is realized on the basis of growing information economy, we would not have to count with further worsening. However, if industry and agriculture are the main drivers of growth, then environmental charging will grow together with GDP per capita.

Evaluating the possibilities of domestic social development in the framework of online surveying and database we took into account two important presumptions. The first one is globalization, as a consequence of which thoughts of follower development in the future became meaningless. Globalization spreads every challenges and new solutions throughout the world almost immediately therefore we should not assume that we could go through all development levels in the future which were characteristic to the developed world. Every society must react to the challenges of globalization: they either formulate positive response reactions, or they have to bear them. The second assumption is that – accessing to the EU – we formally became a member of a cultural region, which – apart from adaptation – might bring new possibilities for the future. The latter is to be emphasized thoroughly, because if we do not count with the enhancement of future-shaping range and the openness of future, then we might only anticipate adaptation to external constraints in the future. Our long-run future is invariably open, therefore it is a matter of domestic society, how and to what form they can and wish to shape it.

On the basis of analyses, forecasts, subjective future judgements and expertial foresight workshops we summarized possible changes in Hungary for the next 5 years in two alternative future images.

Getting into periphery

According to the forecasts and imaginations of social opinion forming groups, information society is still a part of reality also in Hungary however it takes a dual form due to our development level and idiosyncratic domestic circumstances. Unfolding of information society is halting, limited and sticking, operation of economy and social institutions is characterized by applied industrial and information driven industrial technologies. Rapid social transformations and our helplessness towards globalization have brought down our social capital. If this erosion pursues and accession to the union demands further adaptation victims, then we might be crowded out to the periphery of Europe, even if our traditional development indicators might advance by adaptation. Social problems might strengthen, social inequalities might increase. The next generation will only be able to inherit severance. Internal social conflicts might become durable, hopelessness might become general, inertia and helplessness might come, pass not only towards globalization, but also towards the interests of the European Union.

Moving towards membership of the developed Europe

Positive expectations appearing in data and opinion forming forces give the hope that we might assume the unfolding of an alternative, which rises Hungary to a part of the developed Europe, both in economic and social sense (not just politically). This might only be realized, if positive economic and social indicators developed durably further, and favourable changes took place within the reduction of negative attributes. This is unimaginable without the requisition of additional external resources. These resources are not limited to classical capital injection. It is essential that we take part in different development programmes of European Union (eEurope, sustainable development etc.), and make use of funds actively and prospectively. Furthermore, responsible imaginations and activities of inhabitants, social communities and institutions for the future must gain an increasing role in society. Governmental and local policy should support, help and build upon these individual and local initiatives. Politics should inspire the distribution of responsible and active life-form, and the corroboration of environmental-awareness and solidarity in civil communities. Traditional solutions of welfare states cannot be probably applied to solve the problem of increasing social inequalities amid the circumstances of globalization and information society.

The two outlined ways faced by domestic economy and society show that *Hungarian society and economy have the opportunity to choose between many pathways. In making use of possibilities provided by the latitude, renewal of socio-economic processes and renewing, creative power of human factors are essential.*

Conclusions

It was showed a procedure in which the objective and subjective approaches were intertwined into a two-way approach for creation of future images. In this context online stability/instability analysis was done instead of simply trend extrapolation. Subjective future opinions and expectations were questioned in a way that questions were referred to the subjects of stability/instability analyses instead of questioning desirable future expectations of opinion forming groups. Changes are mostly expected in areas where trends are unstable, and at the same time future imaginations significantly differ from one another. *A learning process was generated in this way.* The renewed knowledge is embodied in our modified methodology and methods applied on the one hand and in the renewed and quickly refreshable future images information on the other hand.

Our procedure and results of this case study can be used by different social groups, decision makers, learners' groups etc, via the Internet, to develop their future images, to plan actions and for other purposes. The re-created future image alternatives can become the subject of further communication about the Hungarian future images. *The procedure itself gives possibility to quickly renew future images conceptions of users. The research presented above shows neither the whole Hungarian population nor the opinion leaders' view. The main purpose of it was to demonstrate the usage of a web-based tool and the integration of 'hard' and 'soft' foresight methods.*

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Strategy Analysis and Creation by Simulation – An Experimental Case in the General Game[1]

Introduction

There are many cases when we cannot give a theoretically good answer such as in the case of the General Game (*Mérő,* 2007). One player's success depends on the number of players, on all the strategies they give one-by-one, not to mention the fact that we don't have any previous information about their behaviour. In this paper we try to find a solution for these uncertain situations through solving the General Game problem by simulation.

We do not know the number of players, neither are we aware of their behaviour in the General Game, but if we had a good parameterized model for analyzing the possible behaviour of the whole group, then we could attain good solutions which could significantly outperform the average. This issue can be observed in a variety of fields throughout the world. People face this kind of problem when trying to optimize the marketing budget of a party among the districts (*Merolla, Munger, Tofias*, 2000). But many enterprises could face the same situation when there is a market which was ruled by a big monopoly, but where the monopoly disappears, and many competitive enterprises join the market and there is no relevant, available information, the only thing that remains is wide scale competition.

The attributions of the General Game

There are many types of what we call 'The General Game'. The Colobel Blotto's game (*Partington*, 2002) is the most well known. However we have created a bigger and more

complex problem, with slightly different rules based on Mérő's ideas (*Mérő*, 2007). There are 12 towns that you can occupy with a total of 120 soldiers. There are two players in each game and both produce a strategy which details the number of soldiers they send to each town. The town's rule is that you cannot send more soldiers to one town, than the number of soldiers you sent to the previous town. This means that if you sent 30 soldiers to the first town, you cannot send more than 30 soldiers to the second town.

There are two strategies playing against each other in each game, points are gained after the towns they occupy. 5 points are given after a town is occupied, which means that the occupier sent more soldiers than the opposite player. In the case when the opposite player has not sent any soldiers to that town, then that town is worth only 1 point. In the case where both players sent the same number of soldiers to a town, players are awarded 2-2 points. Nobody is awarded points if a town has not been issued with soldiers. Everybody has to produce one strategy in the competition, and this strategy plays against every other strategy one by one. The final rank is based on the total points that one player achieves from all games that he played.

Table 1. **Example how to calculate the points of the General Game**

Towns	1	2	3	4	5	6	7	8	9	10	11	12
A's strategy	15	15	15	15	10	10	10	10	8	8	4	0
B's strategy	30	30	15	15	6	6	6	6	6	0	0	0
A' points	0	0	2	2	5	5	5	5	5	1	1	0
B' points	5	5	2	2	0	0	0	0	0	0	0	0

In this example A gets 0+0+2+2+5+5+5+5+5+1+1+0=31 points and B gets 5+5+2+2+0+0+0+0+0+0+0+0 = 14points. If there is 'n' number of player then A and B have to play 'n-1' games like this and the final rank comes from the total points they got from these 'n-1' games.

First of all there is in no dominant strategy. Each strategy could hypothetically be the winning formula. (See proof in the Appendix!) To create a winning strategy in the competition, we should be aware of all the strategies that are in use. We naturally

cannot gain such information, and even if we could obtain all the other strategies, with hundreds of players, it would still be a very complex mathematical problem.

When this game was created by Mérő with very similar rules, he wanted to observe the perfect mixture of competition and cooperation. In this General Game if we send soldiers to numerous towns, it means that we cooperate with the others, because the other players also want to gain more points. If we concentrate our soldiers into the first towns, it means that we are more competitive and we want to defeat our opponents, rather than collect more points. The most cooperative strategy is if we send 10 soldiers to all the 12 towns. It can be very efficient for cooperating, but it can be abused very easily at the same time.

Choosing competition or cooperation could be the key problem of any strategy maker in this game. There is another notable problem in relation to this question, the iterated prisoner's dilemma (*Axelrod*, 2006). A similar question was raised, which asked about the amount of competition and the amount of cooperation we should use in the well-known prisoner's dilemma if it is iterated. The Tit-for Tat strategy turned out to be the best, which tries to cooperate, but if the other is not willing to collaborate, his behaviour will revert immediately to competition. According to the experience of the Iterated Prisoner's Dilemma we could think that we will find something similar to this in the General Game. We should cooperate, but compete a little at the same time.

There are several experiments for Colonel Blotto's game (*Merolla, Munger, Tofias*, 2000), but there are very important differences in our rules (non-increasing the number of soldiers) which makes it incomparable. But László Mérő conducted some experiments on little groups with slightly different rules. There were only 12 soldiers in that game, not 120. He found that 'the winning' strategy was to send 2 soldiers to the first six towns. In three different small groups, experiments showed the same result. He interpreted this as the balance of competition and cooperation. The players cooperated half way, but they competed as well with each other.

We have already seen that there is no dominant strategy and that even when knowing all the other strategies, it is hard to determine a winner strategy. However we are unaware of all the strategies, neither are we conscious of the number of the players. In this case

we could analyze the competition with only two players. With proof in the Appendix we can demonstrate that there is no pure Nash equilibrium. There must be a mixed Nash equilibrium (*Forgó, Pintér, Simonovits, Solymosi,* 2005), but each player has more than 76 million possible strategies. In this case even with a computer, it would be hard to calculate the mixed Nash equilibrium. Not to mention a case where we have hundreds of players, and we do not know the number of players either. Given these facts we chose to use the method of simulations, and we do not want to find an optimal solution, rather a 'good' one. A Good solution is a strategy, if it gets more points than the average plus its variation.

The General Game based on the simulation approach

The Monte Carlo simulation is well-known from the Monte Carlo location, and its gambling history. In the Second World War it became a very popular method to analyze complex problems (*Metropolis,* 1978). This method is efficient to use when the complexity of the problem consumes the capacity of the calculation. We used Excel to build up our simulation, which satisfies all the conditions for random numbers that is required[2].

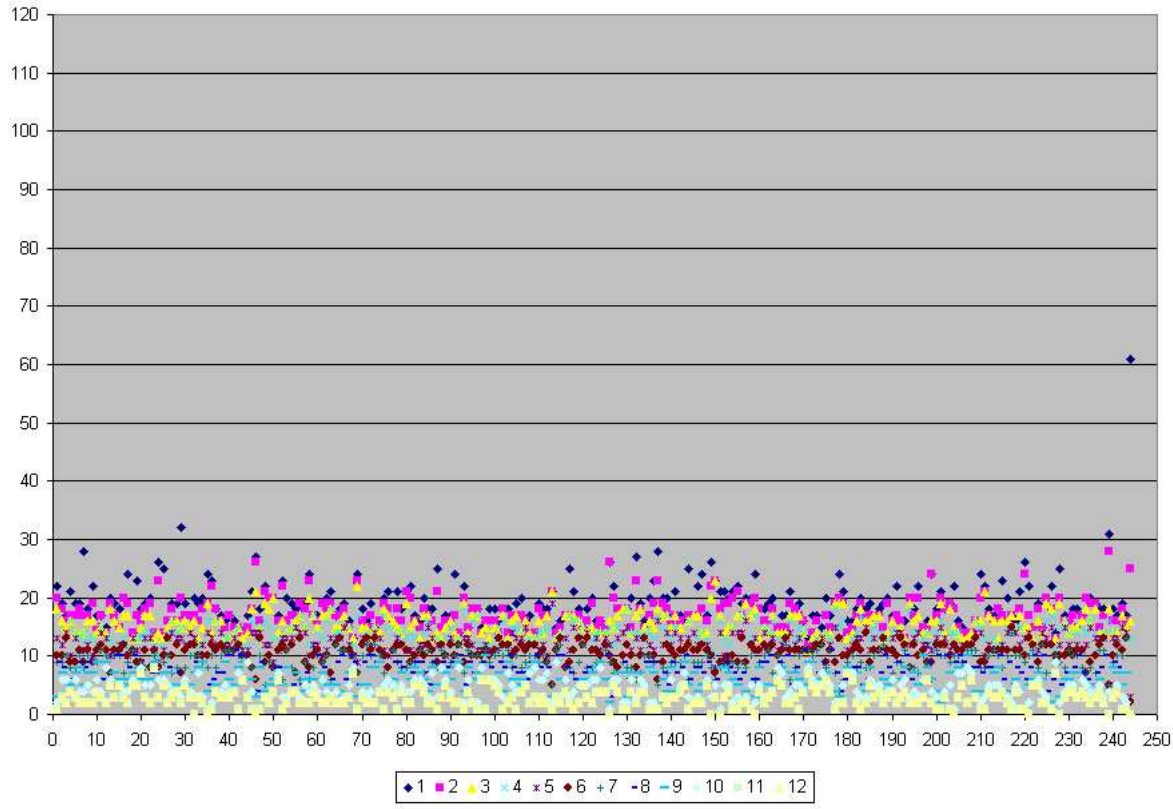
We used a 500 strategies sample in our analysis. Two types of strategies were generated: one was a cooperative and another was a competitive type of strategy. The sample always contained only these types of strategies. We call the cooperative type of strategy 'Independent Uniform Distribution' (from now on 'IUD') and the competitive type of strategy 'Digressive'.

In this case we used the IUD strategy to generate 12 numbers then we normalized their sum to 120 and put them into a non-increasing order to attain an appropriate strategy. In this case the number of soldiers sent to any town is around 10 with a decreasing order. Figure 1 illustrates 245 strategies which were generated by the cooperative strategies method.

We can see the 245 strategies on the X-scale and we can see the number of soldiers on the Y-scale. The 12 different dots show the number of the soldiers in the 12 different

towns. Because of the method, it is evident that the biggest number represents the number of soldiers in the first town.

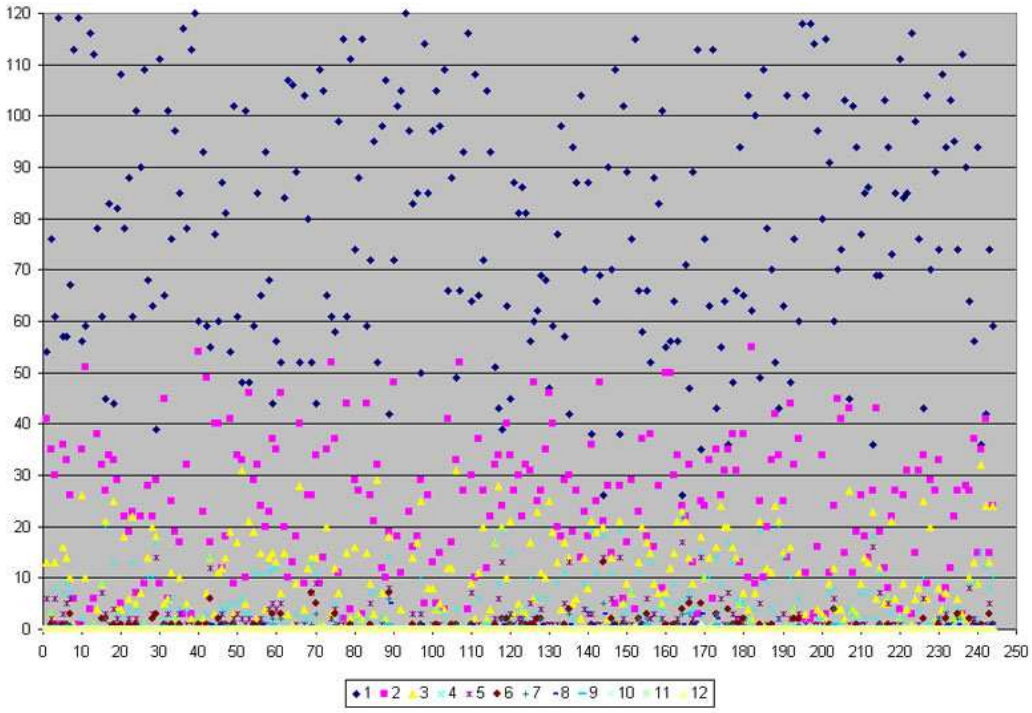
Figure 1. **Generated sample by IUD (245 strategies)**



Generating Digressive strategy in this case we take an interval of 0-120 with a uniform distribution and we generate a number (called x) out of it. Then from 0-(120-x) we make another random number with the same method. And we generate 12 numbers like this. Usually at the end they are 0. We put then into a non-increasing order to get an appropriate strategy. (See the Figure 2.)

In the Figure 2 we see 245 digressive strategies. On the X-scale the strategies on the Y-scale the number of soldiers can be seen and the 12 different dots represent the 12 towns. We can see that most of the soldiers are concentrated in the first 3-4 towns. Comparing to the IUD strategy, the Digressive strategy has a much more variations and they focus usually on the first 8 towns. It means that the Digressive strategies are more competitive than IUD strategies because it usually does not send any soldier to the last four towns. But the IUD strategy almost always sends at least 1 or 2 soldiers to each town.

Figure 2. **Generated sample by Digressive method**



Set of the strategy samples and finding good strategies

In reconstructing the real strategy sample, it is crucial to find good solutions to analyze and create appropriate strategy samples. We observe strategy samples which consist only of IUD or/and Digressive strategies. So a strategy cluster can consist of 100% IUD or Digressive strategies but can also consist of a mixture of IUD and Digressive strategies, too.

We can see a strategy sample in Figure 3 which consists of 85% IUD and 15% Digressive strategies. From now on we will classify the clusters by the percentage of IUD strategies. As in the previous example we attained an 85% IUD cluster. We cannot determine an optimal strategy, not even a method that could determine generally optimal strategies, because it always depends on the specific sample. We define the good strategy in a given sample with a given mixture of IUD and Digressive methods, which as strategies can win at least five times in different but the same mixture of samples. We find a good solution by simulations where we create a sample with a given mixture, then choose the winning strategy. We keep this strategy and create another

sample. If this strategy wins then we keep it. If another wins then we keep the new winner. We do it until one strategy wins five times in a row.

Figure 3. **Generated of IUD sample in 85%**

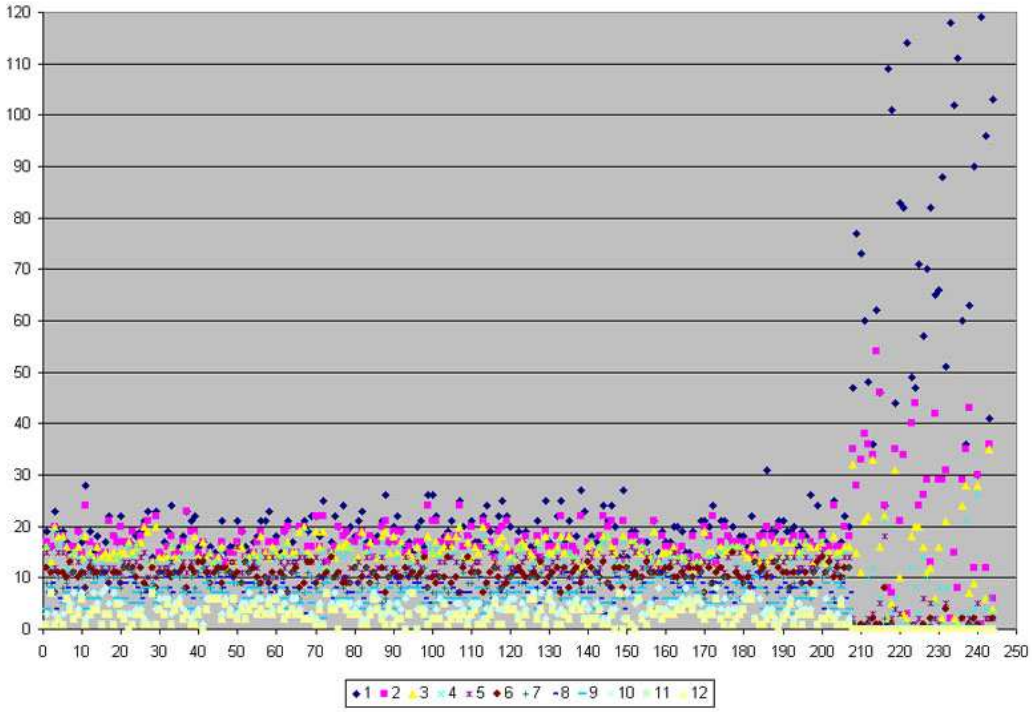


Table 2. **Optimized strategies on different samples**

X	FAE %	1	2	3	4	5	6	7	8	9	10	11	12
1	**0%**	24	22	19	15	13	6	5	5	4	3	2	2
2	**5%**	25	23	21	17	11	7	6	5	2	1	1	1
3	**10%**	21	20	20	19	15	7	4	3	3	3	3	2
4	**15%**	20	19	19	18	15	13	4	3	3	3	2	1
5	**20%**	20	20	19	14	14	13	5	4	3	3	3	2
6	**25%**	20	20	18	17	14	13	11	2	2	1	1	1
7	**30%**	18	18	17	15	14	13	13	3	3	2	2	2
8	**35%**	19	19	18	14	14	12	10	3	3	3	3	2
9	**40%**	20	20	18	17	14	13	11	2	2	1	1	1
10	**45%**	21	19	18	17	6	6	6	6	6	6	5	4
11	**50%**	18	18	17	15	15	12	11	3	3	3	3	2
12	**55%**	21	19	18	17	6	6	6	6	6	6	5	4
13	**60%**	13	13	12	12	12	12	11	10	9	7	5	4
14	**65%**	13	12	12	12	12	12	12	9	9	7	6	4
15	**70%**	13	13	13	13	13	12	11	11	8	6	4	3
16	**75%**	13	13	13	13	13	12	12	9	7	6	6	3
17	**80%**	13	12	12	12	12	12	12	9	9	7	6	4
18	**85%**	13	13	13	13	13	12	12	9	7	6	6	3

19	**90%**	13	13	13	13	13	12	12	9	7	6	6	3
20	**95%**	14	13	13	13	13	12	11	9	8	6	5	3
21	**100%**	13	13	13	13	13	13	11	10	7	6	4	4

In this table we can find a good strategy for each mixture sample on a scale of 5%. It is interesting to see that in each case a good strategy sent soldiers to each town, even in the totally competitive one, in the 0% sample

Sensitivity analysis

Even though finding a good strategy is a very uncertain method in itself. It truly depends on the rate of the sample mixture. In the sensitivity analysis we observe that one strategy is based on the extent of sensitivity to change in the sample mixture. We use the scale of 5% or 10% of rate of mixture in our analysis.

According to our simulations and analysis, a good strategy is not sensitive to the sample size but the rate of mixture. We have created a program to analyze this problem which makes 11 samples with different rate of mixture and compiles statistics about a strategy in each case. In Table 3 we can see the strategy all 10's performance in each case. So the strategy which sends 10 soldiers into each town achieves this result.

Table 3. **The 'all 10' strategy performance in different samples**

FAE	**0%**	**10%**	**20%**	**30%**	**40%**
Points	**10377,67**	**10743,33**	**11096,33**	**11396,67**	**11825,33**
Sin Failure	**1,800%**	**10,000%**	**19,733%**	**28,000%**	**36,067%**
FtF Failure	**16,9%**	**19,9%**	**21,3%**	**25,3%**	**28,7%**
Opp. AVG	**5853**	**6308**	**6883**	**7436**	**8239**
Opp. StDev	**2111**	**2626**	**3078**	**3362**	**3692**
Effectiveness	**214,2%**	**168.9'0**	**136,9%**	**117,8%**	**97,2%**

50%	**6O%**	**70%**	**80%**	**90%**	**100%**
12195	**12680**	**12982**	**13406**	**13944**	**13922**
42,133%	**47,600%**	**50,600%**	**51,600%**	**43,800%**	**57,400%**
31,1%	**34,2%**	**37,0%**	**40,6%**	**40,2%**	**50,6%**
9020	**9988**	**10792**	**11740**	**12826**	**13837**
3834	**3923**	**3770**	**3566**	**2849**	**1041**
82,8%	**68,6%**	**58,1%**	**46,7%**	**39,2%**	**8,2%**

FAE represents the percentage of IUD strategy type.

Points represent the points that the given strategy attained.
Str Failure represents the percentage of strategies which had better total points, than the given strategy.
FtF Failure represents the percentage of strategies which could beat the given strategy face-to-face.
Opp. AVG represents the average total points of the opposite players.
Opp StDev represents the variation of the total points of the opposite strategies.
Effectiveness gives the percentage based on the extent to which the given strategy exceeds the average, using the variation.

According to this analysis we can state that a given strategy is more stable if it has a 0% Str Failure in more cases. This picture has an interesting conclusion in relation to 'all 10' strategy which can be represented as the totally cooperative strategy. This strategy has the highest rank in the totally competitive environment, but in a more and more cooperative environment it has an increasing number of total points, even though it deteriorates in rank. It gives us two conclusions. Firstly, being cooperative can be a very good strategy even in the most competitive environment. Secondly, getting more points does not ultimately mean that a higher rank is achieved.

Experiment

We organized a game with the rules of the General Game and we gave everyone at the University of Corvinus Budapest 3 weeks to participate. There were some worthwhile prizes for the best. Everyone who participated in this game did so voluntarily. They could send their strategy through the internet or on paper. Each person could only send one strategy, and each strategy had to have a unique ID, which was the unique University ID of the student. At the end of three weeks we collected all the strategies, we then added 15 of our own strategies created by the simulations. Altogether there were 245 strategies in this experiment.

Preliminary sampling

The condition for finding a good solution is to know something about the sample. Without any previous research we cannot assume anything about the sample's parameter. But we suppose that there are only cooperative (IUD) and competitive (Digressive) strategies and that there will be more than one hundred strategies, which means that the sample size will not significantly matter. We made a mini sample based

on university students (given the fact that students will play in the game as well). Eleven students were asked to create a strategy if they intend to participate in this game. They gave the following strategies.

Table 4. **Preliminary sample's result**

X	1	2	3	4	5	6	7	8	9	10	11	12	Total points
1	12	12	12	12	12	12	12	12	12	4	4	4	379
2	11	11	11	11	11	11	11	11	11	11	5	5	353
3	18	18	18	18	18	18	2	2	2	2	2	2	338
4	15	15	15	15	10	10	10	10	5	5	5	5	331
5	15	15	15	15	15	15	15	15	0	0	0	0	330
6	10	10	10	10	10	10	10	10	10	10	10	10	283
7	12	12	11	11	10	10	10	10	9	9	8	8	279
8	30	25	20	10	10	10	8	5	1	1	0	0	232
9	35	34	33	2	2	2	2	2	2	2	2	2	228
10	60	20	20	20	0	0	0	0	0	0	0	0	201
11	50	40	10	5	5	4	1	1	1	1	1	1	152

Predictions about the rate of IUD strategies in the experiment were gained from Table 4. We generated different samples with a scale of 5% IUD differences and we calculated the average number of soldiers in each town, in addition to the standard variation of each town. We calculated the absolute differences between the generated samples and the preliminary sample and we consequently created an index number as the sum of the squares of the absolute differences. The most appropriate sample had the smallest index.

Table 5. **Distance in average between preliminary sample and generated samples**

	AVG											
FAE %	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
0%	74.6	25.5	10.9	4.8	2.4	1.1	0.5	0.2	0.1	0.0	0.0	0.0
5%	73.2	25.5	10.6	5.0	2.5	1.3	0.8	0.5	0.3	0.2	0.1	0.1
10%	70.3	24.0	11.1	5.7	3.2	2.0	1.3	0.9	0.7	0.5	0.3	0.1
15%	66.6	24.7	11.1	6.3	3.6	2.4	1.8	1.3	0.9	0.7	0.4	0.2
20%	62.8	24.7	11.7	6.9	4.2	2.9	2.1	1.6	1.2	0.9	0.6	0.3
25%	61.3	23.8	11.3	7.0	4.7	3.4	2.6	2.1	1.6	1.1	0.7	0.3
30%	59.4	22.3	12.0	7.4	5.2	3.9	3.0	2.3	1.8	1.3	0.9	0.4
35%	56.7	22.4	12.2	8.0	5.7	4.3	3.4	2.7	2.0	1.4	0.9	0.4
40%	52.5	22.6	12.6	8.3	6.1	4.8	4.0	3.1	2.4	1.8	1.2	0.6
45%	50.6	22.1	12.7	8.8	6.6	5.3	4.2	3.4	2.6	1.9	1.3	0.6
50%	47.3	21.5	13.0	9.4	7.2	5.8	4.7	3.8	3.0	2.2	1.5	0.7
55%	44.0	20.5	13.4	10.0	7.9	6.4	5.2	4.2	3.4	2.5	1.6	0.8
60%	41.4	20.6	13.6	10.3	8.3	6.8	5.7	4.5	3.5	2.7	1.8	0.8

65%	38.6	20.6	13.8	10.6	8.7	7.3	6.1	5.0	3.9	2.8	1.8	0.9
70%	36.6	19.2	14.4	11.3	9.2	7.7	6.4	5.3	4.1	3.0	1.9	1.0
75%	33.2	19.7	14.3	11.7	9.8	8.3	6.8	5.6	4.4	3.2	2.1	1.0
80%	30.7	18.9	14.6	12.0	10.1	8.6	7.3	5.9	4.8	3.6	2.3	1.1
85%	27.6	18.2	14.7	12.4	10.7	9.2	7.9	6.5	5.2	3.9	2.6	1.2
90%	***24.6***	***18.1***	***15.1***	***12.9***	***11.2***	***9.7***	***8.2***	***6.8***	***5.4***	***4.0***	***2.6***	***1.3***
95%	22.1	17.6	15.4	13.5	11.8	10.1	8.6	7.1	5.6	4.2	2.8	1.4
100%	18.8	17.1	15.5	13.8	12.2	10.8	9.2	7.7	6.1	4.5	3.0	1.4
AVG	**47.3**	**21.4**	**13.0**	**9.3**	**7.2**	**5.8**	**4.7**	**3.8**	**3.0**	**2.2**	**1.5**	**0.7**

Table6. **Distance in Std between preliminary and generated samples**

	StDev											
FAE %	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
0%	22.9	13.2	8.3	4.8	3.0	1.7	1.0	0.7	0.4	0.2	0.0	0.0
5%	24.9	13.5	8.3	5.1	3.3	2.6	2.0	1.6	1.4	1.1	0.7	0.3
10%	28.4	13.2	7.8	5.5	4.2	3.4	2.8	2.4	1.9	1.4	1.0	0.6
15%	28.9	13.3	7.6	5.5	4.3	3.8	3.4	2.8	2.2	1.8	1.2	0.8
20%	29.9	12.6	7.4	5.7	4.8	4.3	3.7	3.1	2.6	2.0	1.4	0.9
25%	31.6	13.0	7.1	5.7	5.1	4.6	4.1	3.4	2.8	2.2	1.5	0.9
30%	32.7	11.4	7.5	5.7	5.3	4.7	4.2	3.5	2.9	2.2	1.7	1.0
35%	33.2	11.7	7.1	6.0	5.5	5.0	4.3	3.6	2.9	2.2	1.6	0.9
40%	32.6	11.7	6.7	5.8	5.4	5.0	4.4	3.7	3.1	2.4	1.8	1.1
45%	32.9	11.1	6.7	6.0	5.5	5.0	4.4	3.8	3.1	2.5	1.8	1.2
50%	32.4	10.9	6.1	5.7	5.4	5.0	4.6	3.8	3.2	2.5	1.9	1.2
55%	32.5	10.4	6.0	5.7	5.4	5.0	4.5	3.9	3.2	2.6	1.9	1.2
60%	31.0	9.7	5.7	5.6	5.4	5.1	4.5	3.9	3.2	2.6	1.9	1.2
65%	30.0	9.9	5.5	5.5	5.3	5.0	4.4	3.8	3.2	2.5	1.8	1.2
70%	29.5	7.8	5.5	5.1	5.1	4.7	4.2	3.7	3.0	2.4	1.9	1.3
75%	27.1	8.7	5.2	5.0	4.8	4.5	4.0	3.5	3.0	2.4	1.8	1.2
80%	25.4	6.9	4.7	4.6	4.5	4.2	3.8	3.3	2.9	2.4	1.9	1.3
85%	22.9	5.9	4.1	3.9	4.0	3.8	3.5	3.1	2.7	2.3	1.8	1.4
90%	***18.4***	***5.4***	***3.5***	***3.4***	***3.5***	***3.3***	***3.0***	***2.7***	***2.4***	***2.1***	***1.7***	***1.3***
95%	14.2	3.7	2.9	2.8	2.7	2.6	2.6	2.3	2.1	1.9	1.7	1.4
100%	3.0	2.5	1.9	1.6	1.6	1.6	1.7	1.8	1.8	1.8	1.7	1.2
AVG	**26.9**	**9.8**	**6.0**	**5.0**	**4.5**	**4.0**	**3.6**	**3.1**	**2.6**	**2.1**	**1.6**	**1.0**

Table 7. **Index for the distance in average**

FAE %	**AVG**												**Sum of squares**
0%	47.7	6.3	5.0	6.9	7.0	8.2	6.9	6.9	4.7	4.1	3.4	3.4	2665.2
5%	48.8	6.2	5.3	6.7	6.9	8.0	6.6	6.6	4.5	3.9	3.2	3.3	2749.4
10%	45.9	4.7	4.8	6.0	6.2	7.3	6.1	6.2	4.2	3.6	3.1	3.2	2404.6
15%	42.2	5.5	4.8	5.4	5.8	6.9	5.6	5.8	3.9	3.4	2.9	3.1	2052.8
20%	38.4	5.5	4.2	4.9	5.1	6.4	5.3	5.5	3.6	3.2	2.8	3.1	1709.6
25%	36.9	4.5	4.6	4.7	4.6	5.9	4.7	5.0	3.2	3.0	2.6	3.0	1566.6
30%	35.0	3.1	3.9	4.3	4.2	5.4	4.4	4.7	3.0	2.8	2.5	2.9	1389.5

35%	32.3	3.1	3.7	3.8	3.7	5.0	4.0	4.4	2.8	2.7	2.4	2.9	1187.9
40%	28.1	3.4	3.3	3.5	3.3	4.4	3.4	4.0	2.4	2.3	2.2	2.8	907.3
45%	26.2	2.8	3.2	3.0	2.8	4.0	3.1	3.7	2.2	2.2	2.1	2.7	784.5
50%	23.0	2.2	2.9	2.3	2.2	3.5	2.6	3.3	1.9	1.9	1.9	2.6	598.5
55%	19.6	1.3	2.5	1.7	1.4	2.9	2.2	2.9	1.5	1.6	1.7	2.6	433.6
60%	17.0	1.3	2.3	1.5	1.0	2.4	1.7	2.6	1.3	1.4	1.6	2.5	328.9
65%	14.2	1.3	2.1	1.1	0.7	2.0	1.3	2.1	0.9	1.2	1.6	2.5	231.5
70%	12.2	0.0	1.5	0.5	0.1	1.6	1.0	1.8	0.7	1.1	1.4	2.4	168.0
75%	8.8	0.4	1.6	0.0	0.5	1.0	0.5	1.5	0.4	0.9	1.2	2.4	92.1
80%	6.4	0.3	1.3	0.3	0.7	0.7	0.1	1.2	0.0	0.5	1.0	2.2	51.1
85%	3.3	1.1	1.2	0.7	1.3	0.1	0.5	0.6	0.4	0.2	0.8	2.1	21.6
90%	***0.2***	***1.2***	***0.8***	***1.2***	***1.9***	***0.4***	***0.9***	***0.3***	***0.6***	***0.1***	***0.7***	***2.1***	***13.4***
95%	2.3	1.7	0.5	1.7	2.4	0.9	1.2	0.0	0.8	0.1	0.6	2.0	24.2
100%	5.6	2.1	0.4	2.1	2.9	1.5	1.8	0.6	1.3	0.4	0.4	2.0	60.4
AVG	**23.5**	**2.8**	**2.9**	**3.0**	**3.1**	**3.7**	**3.0**	**3.3**	**2.1**	**1.9**	**1.9**	**2.7**	**641.4**

Table 8. **Index for the distance in Std**

FAE %	**StDev**												**Eltérés n.összeg**
0%	6.4	3.8	1.8	0.2	2.1	3.4	3.9	4.3	4.1	3.7	3.2	3.2	160.5
5%	8.5	4.1	1.8	0.1	1.8	2.6	2.9	3.3	3.2	2.8	2.5	2.9	153.6
10%	11.9	3.8	1.3	0.5	0.8	1.8	2.1	2.6	2.6	2.5	2.2	2.6	198.2
15%	12.4	3.8	1.1	0.4	0.7	1.3	1.5	2.1	2.3	2.2	2.0	2.5	199.2
20%	13.4	3.1	0.9	0.7	0.2	0.9	1.2	1.9	2.0	1.9	1.8	2.3	213.6
25%	15.2	3.6	0.6	0.7	0.1	0.5	0.9	1.5	1.7	1.8	1.7	2.3	261.0
30%	16.3	2.0	1.0	0.7	0.3	0.4	0.7	1.5	1.6	1.7	1.6	2.3	286.4
35%	16.8	2.2	0.6	1.0	0.5	0.1	0.6	1.3	1.7	1.7	1.7	2.3	303.2
40%	16.1	2.3	0.2	0.8	0.4	0.2	0.5	1.2	1.4	1.5	1.5	2.1	277.6
45%	16.5	1.7	0.2	1.0	0.5	0.1	0.5	1.1	1.5	1.5	1.4	2.1	286.9
50%	15.9	1.5	0.4	0.7	0.4	0.1	0.3	1.1	1.4	1.4	1.4	2.0	268.3
55%	16.0	1.0	0.5	0.7	0.3	0.1	0.4	1.1	1.3	1.3	1.3	2.0	269.4
60%	14.6	0.2	0.8	0.6	0.4	0.1	0.4	1.1	1.3	1.4	1.3	2.1	224.4
65%	13.5	0.4	1.0	0.5	0.3	0.1	0.5	1.1	1.3	1.4	1.4	2.0	195.5
70%	13.0	1.6	1.0	0.1	0.0	0.4	0.8	1.3	1.5	1.5	1.4	2.0	185.9
75%	10.6	0.8	1.3	0.0	0.3	0.6	0.9	1.5	1.6	1.5	1.4	2.0	129.2
80%	9.0	2.5	1.8	0.4	0.5	0.9	1.1	1.6	1.7	1.5	1.4	1.9	106.1
85%	6.5	3.5	2.4	1.1	1.0	1.3	1.4	1.9	1.8	1.6	1.4	1.9	80.3
90%	***1.9***	***4.1***	***3.0***	***1.6***	***1.5***	***1.8***	***1.9***	***2.2***	***2.1***	***1.8***	***1.6***	***1.9***	***60.1***
95%	2.3	5.7	3.6	2.2	2.3	2.5	2.4	2.6	2.4	2.0	1.5	1.8	95.1
100%	13.4	7.0	4.6	3.4	3.5	3.5	3.2	3.2	2.7	2.1	1.6	2.0	324.2
AVG	**11.9**	**2.8**	**1.4**	**0.8**	**0.9**	**1.1**	**1.3**	**1.9**	**2.0**	**1.8**	**1.7**	**2.2**	**174.6**

According to these tables and statistics we can infer a strong cooperative environment which can be represented by the best in the 90% IUD sample. This technically means that the typical strategy sends soldiers to even the last town.

Constructing good strategies

Based on our statistical findings, we got a 90% IUD sample prediction. Before the preliminary sample participants expected an 80% IUD sample. Finally we created 15 strategies based on this information and we created 12 strategies optimized to a specific sample type, and 3 strategies which were given by the people who were working in this field and analysing it as a comparative research of simulated strategies and more intuitive strategies. In both cases all the available information was used, but in the first case a computer based algorithm produced the strategies and the second case was compiled by people.

First we created samples with 75% 80% 82.5% 92.5% 97.5% IUD rates and in those samples we were looking for good strategies by simulations. We created two good strategies optimized in 100% IUD sample because we found a very strong cooperative environment in our preliminary sample, and our analysis showed that cooperative strategies generally produce good results. To make sure that this method will give good answers we also created strategies which were optimized on 20% 25% 40% 45% 50% IUD sample. These strategies were also useful, as their results could be compared to the more cooperative ones. As mentioned above there were three other strategies which were produced by people with all the available information.

Outcome of the experiment

Everybody participated voluntary from all departments and faculties of the University in the experiments. There were 245 strategies in the game out of which 15 were ours. As for the outcome, 7 of our strategies were in the top 10, but none of them were first.

All the strategies were better than the average, and most of them 9 out of 15 were better than the average plus the standard deviation. These results show that the optimizing method was a success.

Figure 4 shows the players' total points in order, and the line of the average points, in addition to the two lines of the average plus and minus standard deviation. Based on the figure, stronger dots are the strategies which were created by us. Table 9 illustrates our

strategies, their rank, their total points and their IUD rate sample in which they were optimized.

Figure 4. **Results of the experiment and results of the strategies**

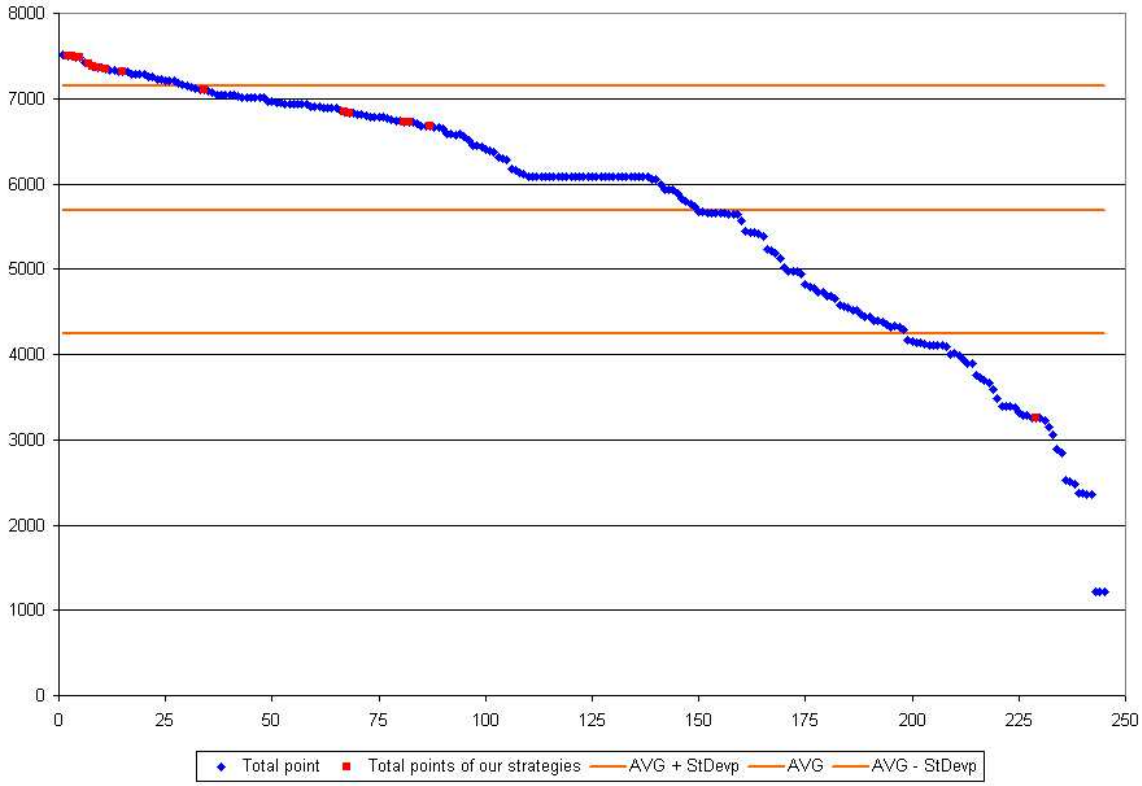


Table 9. **The results of the generated strategies**

Rank	1	2	3	4	5	6	7	8	9	10	11	12	Total points	Opt. IUD %
2	13	13	13	13	13	12	12	9	7	6	6	3	7495	75%
3	12	12	12	12	12	12	12	12	12	4	4	4	7491	Human
4	13	13	13	13	13	13	11	10	7	6	4	4	7489	100%
5	12	12	12	12	12	12	12	11	9	8	5	3	7477	100%
7	13	13	13	13	13	11	11	10	9	6	5	3	7401	92.50%
8	13	12	12	12	12	12	12	9	9	7	6	4	7384	80%
9	14	13	13	13	13	13	11	10	8	6	4	2	7365	82.50%
11	13	13	13	13	12	12	12	12	9	7	3	1	7350	Human
15	13	13	13	13	13	12	11	9	9	8	4	2	7317	97.50%
34	18	18	17	15	15	12	11	3	3	3	3	2	7104	50%
67	20	20	19	14	14	13	5	4	3	3	3	2	6839	20%
68	22	18	18	16	16	12	4	3	3	3	3	2	6829	Human
81	20	20	18	17	14	13	11	2	2	1	1	1	6730	25%
82	20	20	18	17	14	13	11	2	2	1	1	1	6730	40%
87	21	19	18	17	6	6	6	6	6	6	5	4	6677	45%

We can state that the human strategies were not significantly different from the strategies which were generated by the simulations. It is important to notice that human strategies were also attained by gaining all the information from the simulations and analysis. On the other hand, we can state that the more cooperative strategies were more successful. The strategies optimized less than 50% IUD sample were at the end of the list, and the strategies with more than 50% IUD were at the top of the rank. Our expectation turned out to be true. The environment was more cooperative than competitive, and in this case the strategies which were optimized to this environmental condition were more successful. Among the top 20 strategies' total points, there was less than a 2% differences, which means that luck played a large role.

How to generate the sample of the experiment

We have never attempted such a large experiment, and we have not seen any similar experiments to this, where more than 200 volunteers would have played. It is interesting what kind of parameters would have described the best. We analyzed those, which generated a sample that would have best fitted, according to our index.

Table 10. **Distance in average between the experiment and the generated samples**

FAE %	**AVG**												**Sum of squares**
0%	47.7	6.2	4.2	7.3	7.2	7.2	6.3	5.6	4.9	4.3	3.5	3.0	2628.0
5%	46.3	6.2	4.6	7.1	7.1	6.9	6.0	5.4	4.7	4.1	3.4	2.9	2477.5
10%	43.4	4.7	4.0	6.4	6.3	6.3	5.5	4.9	4.3	3.9	3.2	2.8	2150.3
15%	39.7	5.4	4.0	5.8	6.0	5.8	5.0	4.5	4.1	3.7	3.1	2.7	1818.5
20%	35.9	5.4	3.4	5.3	5.3	5.3	4.7	4.2	3.7	3.4	2.9	2.7	1496.2
25%	34.5	4.5	3.8	5.1	4.8	4.8	4.2	3.8	3.4	3.2	2.8	2.6	1362.2
30%	32.6	3.0	3.2	4.7	4.4	4.3	3.8	3.5	3.2	3.0	2.6	2.5	1197.3
35%	29.9	3.1	3.0	4.1	3.9	4.0	3.4	3.2	3.0	2.9	2.6	2.5	1010.6
40%	25.7	3.3	2.5	3.8	3.5	3.4	2.8	2.7	2.5	2.6	2.3	2.4	753.7
45%	23.8	2.7	2.5	3.3	3.0	3.0	2.6	2.4	2.4	2.4	2.2	2.3	641.7
50%	20.5	2.1	2.1	2.7	2.4	2.4	2.1	2.1	2.0	2.2	2.1	2.2	474.2
55%	17.2	1.2	1.7	2.1	1.6	1.9	1.6	1.6	1.6	1.8	1.9	2.2	328.4
60%	14.6	1.3	1.5	1.8	1.2	1.4	1.1	1.3	1.5	1.7	1.7	2.1	238.5
65%	11.8	1.3	1.3	1.5	0.9	1.0	0.7	0.8	1.1	1.5	1.7	2.1	157.5
70%	9.7	0.1	0.7	0.8	0.3	0.5	0.4	0.6	0.9	1.4	1.6	2.0	106.1
75%	6.3	0.4	0.8	0.4	0.3	0.0	0.1	0.3	0.6	1.1	1.4	2.0	48.6
80%	3.9	0.4	0.5	0.1	0.6	0.4	0.5	0.1	0.2	0.8	1.2	1.8	21.7
85%	***0.8***	***1.2***	***0.5***	***0.3***	***1.1***	***0.9***	***1.1***	***0.7***	***0.3***	***0.5***	***0.9***	***1.7***	***10.2***

90%	2.2	1.2	0.0	0.8	1.7	1.5	1.5	1.0	0.4	0.4	0.9	1.7	19.2
95%	4.8	1.7	0.2	1.4	2.2	1.9	1.8	1.3	0.6	0.2	0.7	1.6	44.4
100%	8.1	2.2	0.3	1.7	2.7	2.5	2.4	1.8	1.1	0.1	0.5	1.6	99.9
AVG	**21.9**	**2.7**	**2.1**	**3.2**	**3.2**	**3.1**	**2.7**	**2.5**	**2.2**	**2.2**	**2.0**	**2.3**	**552.5**

Table 11. **Distance in Std between Experiment and generated samples**

FAE %	**StDev**												**Sum of squares**
0%	3.3	3.5	2.0	0.3	1.9	2.9	3.3	3.5	3.6	3.6	3.4	3.3	110.7
5%	5.4	3.7	1.9	0.1	1.5	2.1	2.3	2.5	2.6	2.7	2.7	3.0	95.7
10%	8.8	3.5	1.5	0.5	0.6	1.3	1.6	1.8	2.1	2.3	2.4	2.7	122.8
15%	9.3	3.5	1.3	0.4	0.5	0.8	0.9	1.3	1.8	2.0	2.2	2.5	122.9
20%	10.3	2.8	1.0	0.6	0.0	0.4	0.6	1.1	1.4	1.8	2.0	2.4	133.0
25%	12.1	3.3	0.7	0.7	0.3	0.0	0.3	0.7	1.2	1.6	1.9	2.4	171.1
30%	13.2	1.7	1.1	0.7	0.5	0.1	0.1	0.6	1.1	1.6	1.8	2.3	191.2
35%	13.7	1.9	0.7	1.0	0.7	0.4	0.0	0.5	1.1	1.6	1.8	2.4	205.4
40%	13.0	1.9	0.4	0.7	0.6	0.3	0.1	0.4	0.9	1.4	1.7	2.2	184.3
45%	13.4	1.4	0.4	0.9	0.7	0.4	0.1	0.3	0.9	1.3	1.6	2.1	191.8
50%	12.9	1.1	0.2	0.6	0.6	0.4	0.3	0.3	0.8	1.3	1.5	2.1	176.6
55%	12.9	0.6	0.3	0.6	0.5	0.4	0.2	0.3	0.7	1.2	1.5	2.1	177.5
60%	11.5	0.1	0.7	0.5	0.6	0.4	0.2	0.3	0.8	1.2	1.5	2.1	142.0
65%	10.4	0.1	0.8	0.4	0.5	0.4	0.1	0.3	0.8	1.3	1.6	2.1	119.3
70%	9.9	1.9	0.9	0.1	0.2	0.0	0.2	0.5	1.0	1.4	1.6	2.0	112.7
75%	7.5	1.1	1.2	0.1	0.1	0.1	0.3	0.7	1.0	1.4	1.6	2.1	69.5
80%	5.9	2.9	1.7	0.5	0.3	0.4	0.5	0.8	1.1	1.4	1.5	2.0	56.6
85%	***3.4***	***3.8***	***2.2***	***1.1***	***0.8***	***0.9***	***0.8***	***1.1***	***1.3***	***1.5***	***1.6***	***1.9***	***45.3***
90%	1.2	4.4	2.9	1.6	1.3	1.3	1.3	1.4	1.6	1.7	1.8	2.0	51.3
95%	5.4	6.0	3.5	2.2	2.1	2.0	1.8	1.8	1.9	1.9	1.7	1.9	110.8
100%	16.5	7.3	4.5	3.5	3.3	3.0	2.6	2.4	2.2	2.0	1.7	2.0	405.6
AVG	**9.5**	**2.7**	**1.4**	**0.8**	**0.8**	**0.9**	**0.8**	**1.1**	**1.4**	**1.7**	**1.9**	**2.3**	**117.5**

According to both average and standard deviation differences we can say that the 85% IUD sample is most similar to what was realized in the experiment. Although if we illustrate the generated 85% IUD sample and the sample from the experiments, then they could look very different, they are much more similar to each other than we would think, regarding points calculation.

Figure 5. **The strategies of the experiment**

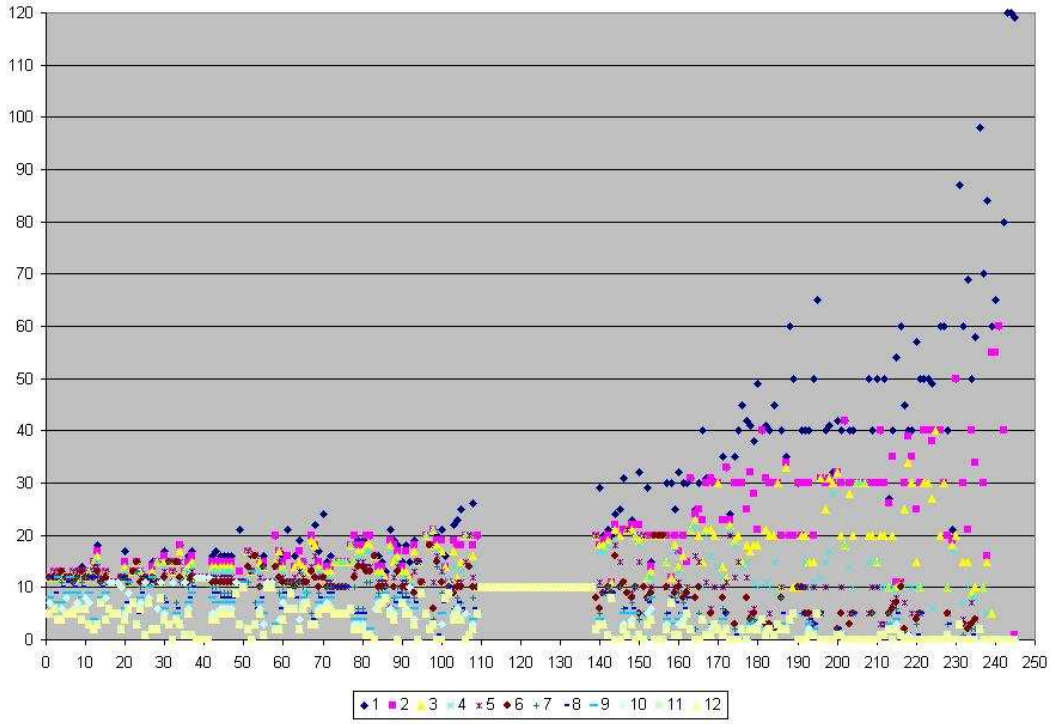


Figure 6. **Strategies of the 85% IUD sample**

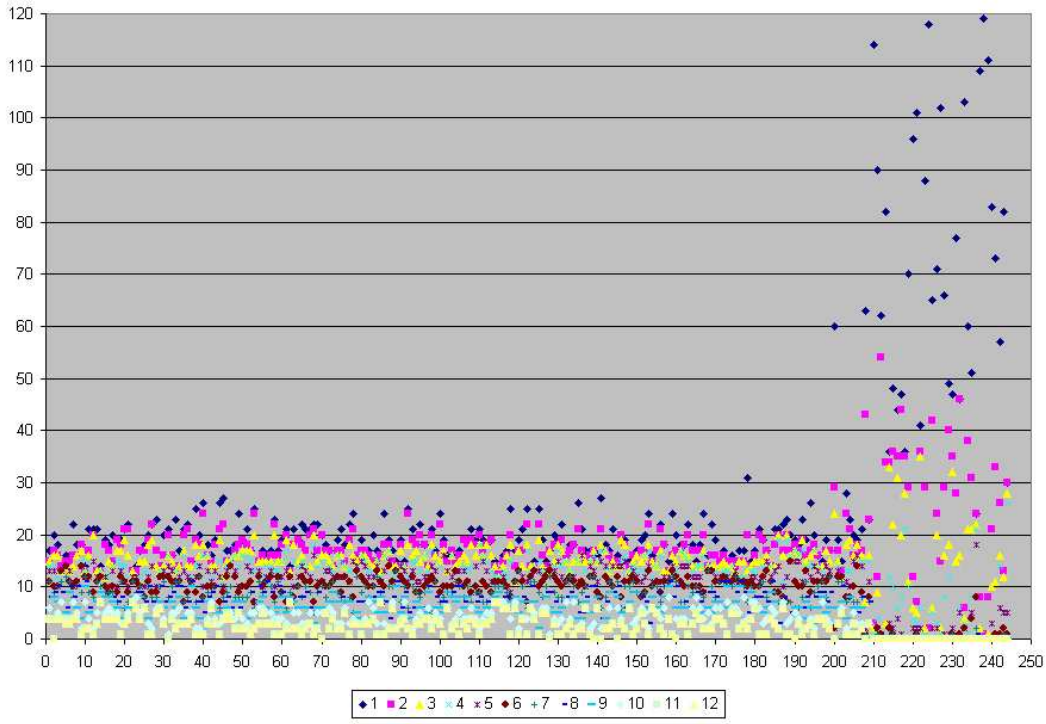


Figure 5 illustrates the strategies of the experiments and Figure 6 shows the strategies of the generated 85% IUD sample. We see 12 dots in a column which represent the

number of soldiers in the 12 towns. The majority of soldiers are in the first town and the least number of soldiers are in the last town. The X-scale shows the rank, which means the most successful strategy is the first column and the least successful is the last column. In the generated sample we can see that 85% of the strategies are cooperative, where soldiers are sent to each town and are divided quite uniformly. The remaining 15% are the competitive strategies, where the number of soldiers can be very high in the first towns, and 0 at the final towns.

Figure 5 of the experiment illustrates that in general, the more competitive you are, the least points you get in total. The number of 'all 10' strategies used is also remarkable. Many people chose the totally simple cooperative strategy and sent 10 soldiers to each. They cannot be in the top of the rank but they beat many of the competitive strategies.

As we have two samples we could compare them according to a matrix which contains a frequency of the soldiers in each town, like in the first town in how many cases are there 120 soldiers, in how many cases 119 … in how many cases 10. We created this matrix with all the towns for the realized experiment sample in addition to the generated sample. If we observe them we can find that the distance between the two matrices is very small. This means that any strategy would get very similar points in both samples. In this sense the 85% IUD generated sample well describes the properties of the sample in the experiment.

Attributes of the experiment's sample

There are other astonishing attributes of the experiment's dataset. It is easily noticeable that there are some preferred numbers. The distribution of numbers is not the same in the randomly generated sample, and in the dataset of the experiment. We cannot observe any preferred number in the randomly generated sample. The experiment's players did have some preferred numbers like even numbers or numbers which are divisible by 5 or 10 as well as the fact that it is hard to find any bigger prime number in the experiment. (See Figure 7 and 8.)

Figure 7. **Preferred numbers in the experiment**

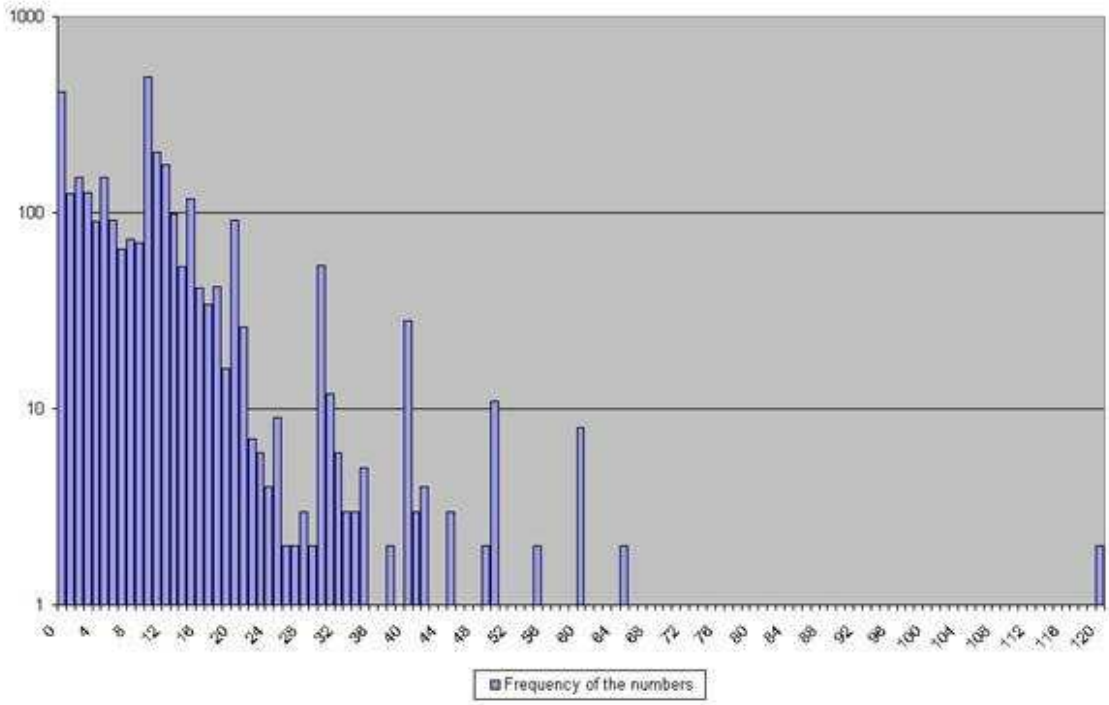
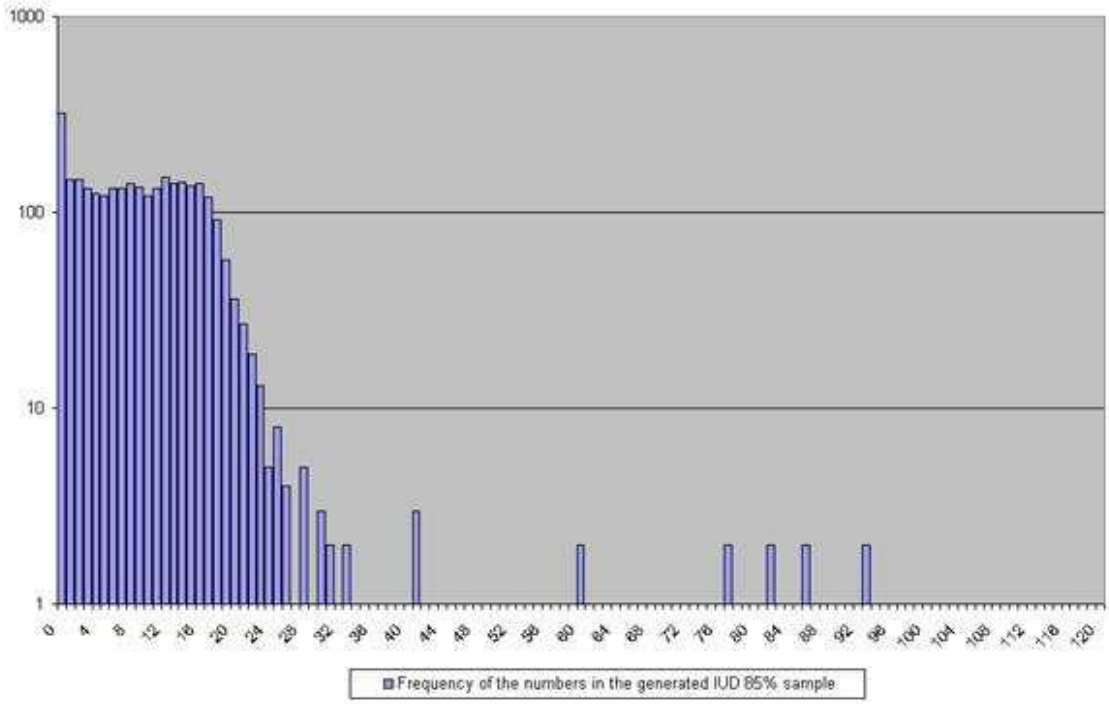


Figure 8. **Frequency of the numbers in the generated sample**



If we analyze the modus of the strategies – the number which appears most frequently in one strategy – we will see differences between the experiment's dataset and the generated sample. Figures 9 and 10 illustrate the modus distribution. There are numbers on the X-scale. On the Y-scale we see that if that number of soldiers were most frequently used in one strategy, then how many times the players used that in the same strategy. In the generated sample, randomness was used to find numbers, so it is not typical for the same numbers to appear frequently in the same strategy. But in the experiment we can see that there were preferred numbers even in one strategy, so one number could arise many times in the same strategy.

Figure 9. **Frequency of the modus in the experiment**

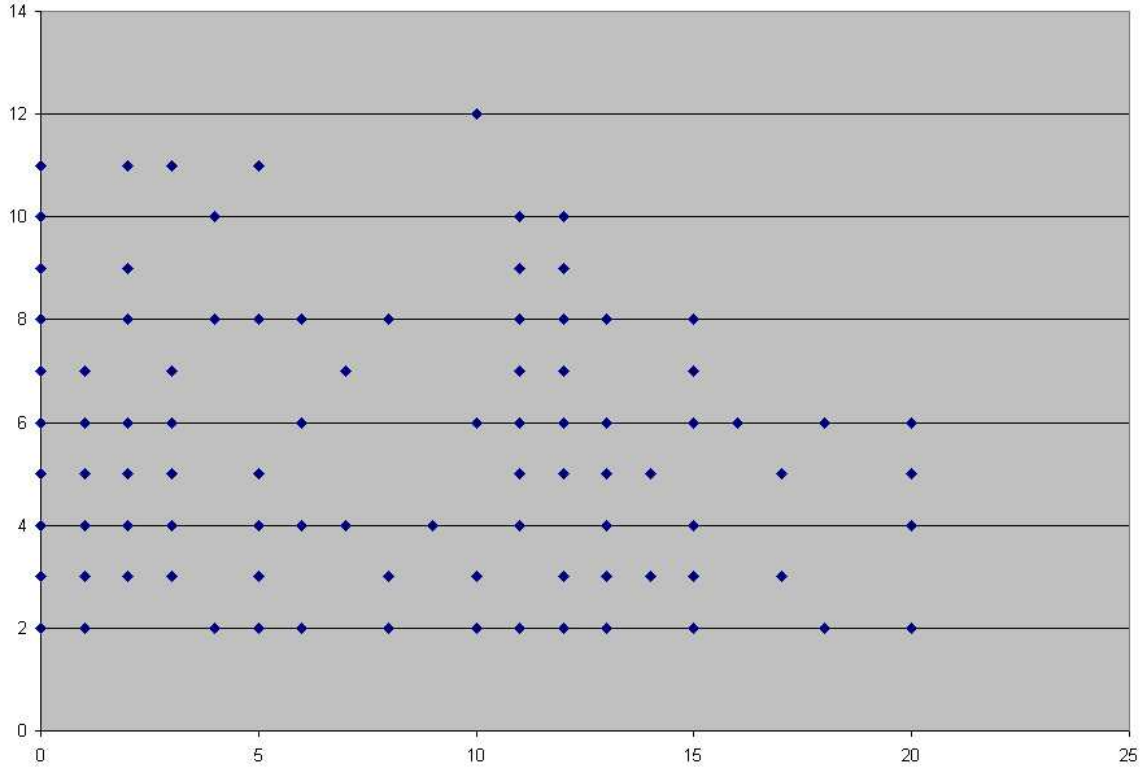
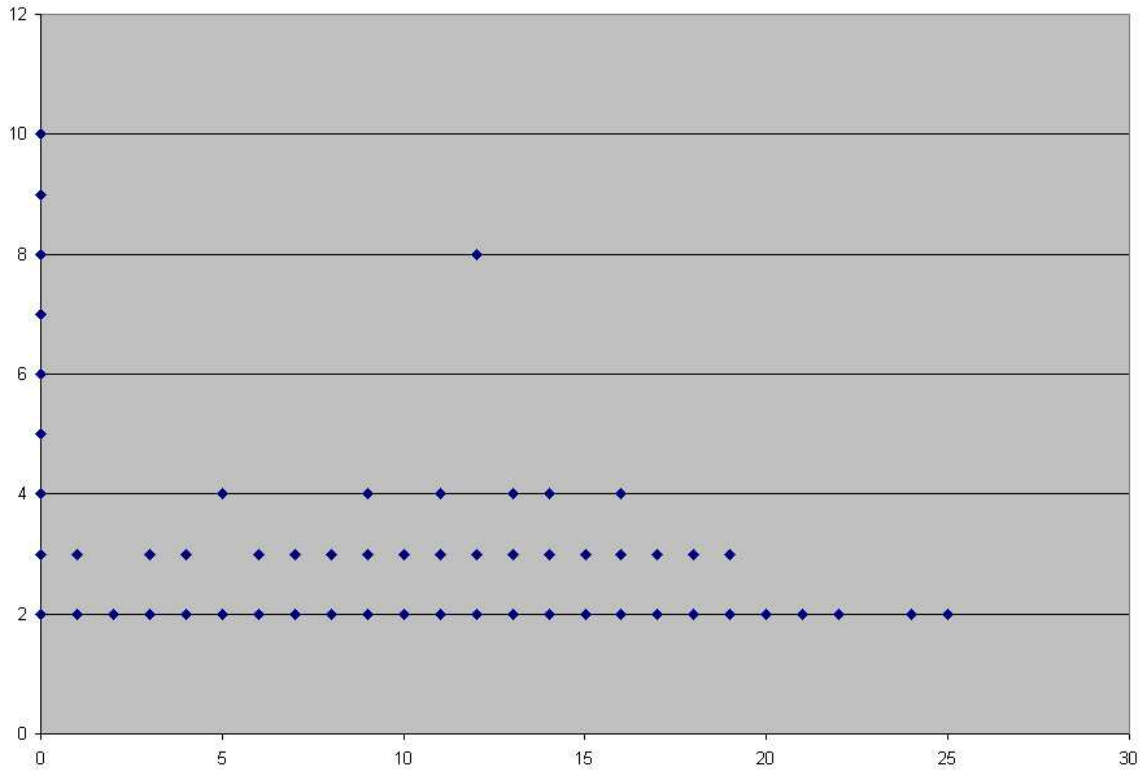


Figure 10. **Frequency of the modus in the 85% IUD sample**



In many ways we could improve our method to find good strategies. But we would still use the method of creating a sample with a given IUD rate, we would also improve the sample through their attributes, like taking preferred numbers or the modus into account. Using learning algorithm or evolutionary algorithm could also be an improvement.

Discussion and conclusion

The general game has both complexity and the uncertainty which makes it very hard to handle and analyse. But in many cases we have to face decisions like the above. We supposed that there are only two types of strategies, and with them we can generate any sample which is relevant. We produced a method to find good and successful strategies, based on the predicted sample type and we tested them in an experiment. We found that with our method we can give outstanding strategies, but not the definite winning strategy. In the end we recommended the use of other methods to improve our results by using information about preferred numbers.

There are many problems which are very similar to the General Game. If the problem is complex and there is uncertainty about the number of the players who are involved in the problem, moreover no relevant information about the behaviour of the participants, then an exact mathematical formula for a solution cannot be given.

The General Game is slightly more specific as a game, because in this situation we have to use a given amount of resources, in this uncertain environment. Moreover, this game is focusing on the question about the extent of our competitiveness and/or cooperativeness in this environment A political party has to face the same problem, when there is an electoral voting system and the party has a given budget to spend on marketing. In this case they have to decide how much they are willing to spend on marketing in each district. How much they should focus on only some of the districts, or whether they should spend money in all districts. According to our results they have to spend money in each district, but they have to focus on only some of them. The liberalization of the energy sector in Hungary raised very similar problems to the ones that can be found in the General Game. After the disappearance of monopoly, big competition for the market shares appeared, but without any information about competitive behaviour.

The General game can be compared to environments where there is a state of large competition as a result of low entry cost. Typically the digital world is like this. It is very easy to appear on the internet, another significant question relates to the extent you should cooperate in addition to the extent of competitiveness with other sites and other services in the same sector.

What advice has the General Game produced? The basic principle behind the construction of this game was to analyse the behaviour of competition and cooperation. Mérő created the game for this purpose and he observed all results from this aspect. We came up with a simulation procedure to prove it. Our results corresponded with the international papers on this topic. You should be cooperative but you have to be a little competitive as well. According to this, we can conclude that our general advice is the following: Be cooperative even in the most competitive environment, but never too much. But rather be too cooperative then too competitive. This result may be classed as being slightly in contradiction to microeconomic theories about perfect competition. It

says that in perfect competition everybody competes with each other and it is the best and most logical decision for them.

In this day and age, we can see many cases which reflect the rate companies cooperate with each other while being in a state of perfect competition. There is an indirect method of cooperation like a price cartel when companies do not use lower prices than their costs just because of competition. The low budget airplane sector went bankrupt in the United States because of price competition. But there are direct methods as well. Nowadays it is typical that there are common innovation projects between companies which display total competition with each other in the same sector. There are such well known innovation projects for IBM, but Arcelor Mittal is in the same situation with the Open Innovations project. We think that in practice the conscious use of mixed logic of cooperative and competitive strategy creation can also be very useful in certain circumstances.

As seen in our theoretical model and real life examples, thinking on the lines of a mixed strategy is something which is inevitable nowadays. What is more, in real life situations this mixed strategy means that we cannot afford not to think in terms of cooperation.

Appendix

There is no strategy which could not be defeated by any other strategy.

Proof: There are two types of strategies. One is when the strategy is that we send all the 120 soldiers to the first town, the second type is when we do something different. The first type of strategy can be beaten by the strategy when we send 10 soldiers to each town. All other strategies can be beaten by a strategy which is exactly the same, although the difference being: to the last town we send one soldier less, and to the first town we send one soldier more. This means none of the strategies is unbeatable in a game. And there is no Nash equilibrium among the pure strategies, if we have two players.

Notes

1 This study was developed on the basis of a paper titled ‘Stratégia-elemzés és – kialakítás szimulációval a hadvezérjáték kapcsán’, prepared in the framework of ‘Scientific Circle of CUB’s students’. The consultant was Éva Hideg. The paper gained first reward in the Section of Futures Studies at the Conference of Scientific Circle of CUB’s students, in 2009.

2 The General Simulator can be available at: http://wif.uni-corvinus.hu/tdk/otka/hadvezer_szimulator.xls

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Tamás Kristóf

Data Reduction and Univariate Splitting – Do They Together Provide Better Corporate Bankruptcy Prediction?

Introduction

For many years the number of companies becoming insolvent has been increasing in the majority of Central and Eastern European countries recently accessed to the European Union[1], and the crisis has substantially boosted this tendency. Accordingly an escalating interest can be noticed towards multivariate statistical bankruptcy prediction models in business life. Statistical based solvency prediction is most extensively carried out by financial institutions. Since the Basel II Capital Accord has been in forth for financial institutions, it is not the question whether to apply statistical forecast methods in credit appraisal and probability of default prediction, but it is a great problem, which methods should be applied and how. Therefore the discussion on methodological problems of corporate survival and solvency prediction is living its renaissance in many countries.

Corporate survival and solvency prediction is a complex problem. Researching this field is encumbered and at the same time challenged by the ascertainments that no unified theory exists to explain and understand organizational survival, no method exists to guarantee unambiguous survival prediction, and it is noticeable that different empirical researches result in contradicting conclusions. Throughout the 40-year-history of multivariate statistical bankruptcy prediction no agreement was made among scholars in the field what explanatory variables provide the most reliable prediction. Consequently competitive and supplementary theoretical and methodological approaches coexist in the field (*Kristóf,* 2008).

Data Reduction and Univariate Splitting – Do They Together Provide Better Corporate Bankruptcy Prediction?

For financial ratio based multivariate statistical corporate bankruptcy prediction discriminant analysis has been widely applied since the pioneer work of A*ltman* (1968), which has been more and more replaced since the 1980s by logistic regression analysis (*Ohlson*, 1980). The recursive partitioning algorithm based decision trees (*Frydman, Altman, Kao,* 1985) also began to spread in the 1980s. Since the 1990s the neural networks have given a boost to improve the reliability of solvency forecast models. Neural networks were firstly applied for corporate bankruptcy forecasting by *Odom, Sharda* (1990).

Several empirical researches were accomplished to compare the performance of different bankruptcy forecast methods, a summary analysis is provided inter alia in *Virág, Kristóf* (2005). According to the majority of the authors neural networks overperform the traditional methods; whereas some authors (i.e. *Laitinen, Kankaanpaa,* 1999) arrived at the provocative conclusion that all methods provide similar performance.

The aim of this article is to compete the most frequently applied bankruptcy forecast methods on a Hungarian corporate database. Besides predicting the solvency status, probability of survival values are forecasted for each company by each method. Within the framework of empirical research the performance of logistic regression, recursive partitioning algorithm and neural networks is compared.

Besides developing models using the original continuous financial ratios two transformations were applied with the hope to improve predictive power. The first one was principal component analysis to preserve explained variance of linear correlated variables and at the same time handle multicollinearity. The second one was chi-square based univariate decision trees to derive categorical variables from continuous ones with the aim to find relatively homogeneous risk categories. It was also tried to accomplish the two transformations together by splitting the factors.

Our hypothesis was that data reduction and univariate splitting together provide the best prediction with each forecast method, and neural networks perform better than logistic regression or recursive partitioning algorithm.

The frameworks of empirical research

The traditional objective of corporate survival and solvency forecasting is to find out with the highest reliability whether a company is expected to go into bankruptcy within one year after the turning day of its last annual report, and to estimate probability of survival values for each company.

Size and breakdown of the sample, explanatory variables

To ensure the applicability of models on any company it was set as a requirement towards data collection that data available for modeling has to come from public annual reports and company register. Balance sheets and profit&loss statements from 2004 were collected. The sample contains 504 companies from which 437 are solvent and 67 are insolvent. This magnitude of observations is statistically manageable; furthermore many companies and small/middle banks usually possess clientele of that size, accordingly it can be argued to be a typical modeling problem in business life.

The empirical research equates corporate failure to the legal possibilities of insolvency, namely the declaration of bankruptcy procedure, liquidation or winding up. These three cases can be measured well empirically, and surely mean insolvency. From the insolvent observations 1 fell under bankruptcy procedure, 29 declared winding-up and liquidation procedure was announced against 37 companies. The legal category of insolvency was not differentiated later. Solvent observations were denoted by 0 and insolvent ones by 1.

Explanatory variables were defined using information expressing corporate size, industrial classification, profitability, turnover, liquidity, capital structure, debt, cash flow and annual growth. Variable selection was preceded by an in-depth professional analysis. Altogether 31 financial ratios were defined. Calculation formulae of the financial ratios are summarized in Appendix 1.

Data collection was followed by data preparation for modeling. It is often more difficult than modeling itself, since unpredicted problems with observations and/or variables might emerge. The calculation of two financial ratios was limited by the zero value of

the denominator. From the companies in the sample 6 had zero inventory and 11 zero trade receivables, thereby making it impossible to calculate inventory turnover and trade receivables turnover ratios. This problem was solved – by considering data mining experiences in the field of financial modeling (*Han, Kamber*, 2006) – in a way that missing inventory turnover values were substituted by the median value of other observations, and the missing trade receivables by the 97.5% percentile value as a truncated maximum.

It was substantially more difficult to use three financial ratios distorted by double negative division. The coexistence of negative nominator and negative denominator concerned return on equity (ROE) in 28 cases, operating profit growth in 74 cases, and profit after tax growth in 67 cases. In the case of ROE it means that in the sample there are 28 companies, the liabilities of which first exceed their total assets and second they closed the financial year with loss, and despite these facts the ratio shows a positive profitability. This problem was naturally characteristic to the insolvent observations. As for the growth ratios of the two profit categories companies having negative profit both in the previous and in the actual year (even with further worsening operating or after tax profit in the actual year) could be wrongly characterized by positive growth. In such case a widely used data mining technique is to replace the ratio-value of companies having double negative items with the minimum ratio-value of the other companies, however, considering the small sample and the relatively large number of concerned companies these three ratios were discarded from the empirical research. It would have been unreasonable to discard the given observations, since in that case inadequately few insolvent companies might have remained in the sample.

Distribution of companies in the sample could be classified into 10 national economic branches, 41 industries and 164 special-branches, the latter means four digit Standard Sectoral Classification of Economic Activities (SSCEA) code breakdown. Manufacturing companies represented themselves in the greatest share within the sample.

Still before the 1990s some scholars (like Platt, Platt, 1990) extensively dealt with the problem how corporate ratios and industry performance together influence the

likelihood of insolvency. Since then the most efficient bankruptcy prediction models have been applying industrial distinction. To compare financial ratios of companies operating in different industries the differences from special-branch averages were considered instead of pure financial ratio-values. The correction was carried out by the following formula:

$$\frac{\text{Individual ratio value} - \text{Special-branch average value}}{\text{Special-branch average value}} \quad (1)$$

Correction by special-branch averages ensures the comparability between companies having pretty different fields of activities. From this point empirical research does not refer to the individual financial ratio-values, but to their variance from their special-branch averages. Thereby time stability of the models is improving, since better or worse performance compared to the averages might remain a relevant perspective to evaluate insolvency after several years.

To validate models and avoid overtraining the sample was partitioned on the basis of simple random selection to a 75% training and a 25% testing set. It is a thumb rule of bankruptcy prediction that if the modeling database (training set) contains less than 50 insolvent observations, it is not reasonable to apply multivariate statistical methods (*Engelman, Hayden, Tasche,* 2003). This requirement was barely met in the empirical research, as within the training sample containing 371 observations 320 were solvent and 51 were insolvent, and within the testing sample containing 133 observations 117 were solvent and 16 were insolvent.

Data reduction, univariate splitting

Data reduction was carried out by principal component analysis (PCA), which is commonly used in financial modeling (see i.e. Hu, Ansell, 2007). PCA constructs uncorrelated components (factors) from the linear correlating variables. The essence of the procedure is that some components can explain a great share of the total variance of the variables; thereby it is enough to have fewer dimensions for modeling. PCA is proven to be able to handle multicollinearity and reduce data. For applying the

procedure it is key to decide on the number of components, which is most frequently defined with the help of eigenvalues above a certain threshold. Eigenvalues show the aggregation capability of input data variances for each component. Factors were constructed by considering the following criteria:

- strong and significant linear correlation exists between variables,
- from financial viewpoint variables have similar meanings,
- eigenvalue is higher than 1,
- Kaiser-Meier-Olkin (KMO) measure of sampling adequacy is at least 50%,
- the factor is significant using the Bartlett-test.

Altogether seven factors were derived. Appendix 2 summarizes the factor equations together with eigenvalues, total explained variances and KMO values. All the factors were significant according to the Bartlett-test.

According to our experience PCA might improve model performance, however, special attention needs to be taken when using data reduction in bankruptcy prediction, since the combination of PCA presuming homogeneity and classification procedures presuming subsamples might lead to the confusion of subsamples.

Univariate splitting was accomplished by the Chi-squared Automatic Interaction Detection (CHAID) method. CHAID is a classification method for building decision trees by using chi-square statistics to identify optimal splits (Kass, 1980). The procedure first examines the cross tabulations between each of the independent variables and the outcome, and tests for significance using a chi-square independence test. If more than one of these relationships is statistically significant, the method will select the predictor which is the most significant. If a predictor has more than two categories, these are compared, and categories that show no differences in the outcome are collapsed together. This is done by successively joining the pair of categories showing the least significant difference. This category-merging process stops when all remaining categories differ at the specified testing level.

CHAID is excellent to explore the relationship-characteristics between the target variable and the explanatory variables one by one, and is able to select the variable which in itself has the strongest predictive power. The essence of this procedure is to form groups, which most differ from each other considering solvency.

Appendix 3 contains the univariate decision trees. It was reasonable to build decision trees for nineteen original variables and six PCA factors. The trees can be interpreted by examining the distribution of solvent and insolvent observations within nodes. The top node incorporates the total sample having 13.3% insolvent rate. A category is regarded as risky if the insolvent rate substantially exceeds 13.3%, and not risky in case of substantially lower insolvent rate. Financial ratio thresholds are illustrated above the nodes. To make modeling easier the belonging to the categories was denoted by dummy variables, hence the CHAID split models exclusively contain 1/0 values. It was expected that the application of univariate decision trees results in a better predictive power.

Applied forecast methods

The following points briefly analyze the application assumptions, advantages and drawbacks of the applied multivariate statistical forecast methods. It was planned to apply discriminant analysis as well, however, according to our experience, this method results in a poor performance when considering categorical variables.

Logistic regression analysis (Logit) is a widely used approach to model relationships between explanatory variables and the likelihood of a binary response. The procedure orders probability of survival/bankruptcy values to the weighted independent variables by fitting a logistic regression function estimated by the maximum likelihood method.

The advantages of the method are robustness, exact appearance of relative contributions and easy interpretation. Drawbacks are the possibility of small-sample biasedness, the sensitivity to outliers, the accidental emergence of multicollinearity and the application of predefined function-type. If the solvency rate of the sample differs from that of population, the estimated probability of survival values might be modified by probability-calibration in such a way that the average probability of survival value

equals to the desired rate, at the same time the order of probabilities estimated for the observations must be preserved.

The recursive partitioning algorithm (RPA)[2] attempts to build a decision tree by iteration, using univariate partitioning, setting simple decision rules, and constructing branches. The aim is to establish the most homogeneous classes. The algorithm establishes branches as long as it finds partitioning variables. The first partitioning variable is found at the top of the tree. The roots of tree mean the solvent and insolvent classification after the partitioning.

The advantages of the method are the few application assumptions and the obvious interpretation of the decision rules. Drawbacks are the accidental appearance of overtraining, the assumption of discrete classification capability and non-overlapping between the groups. No statistical testing can be carried out on the model, and the relative contribution of variables cannot be unambiguously determined. Probability of survival values can be estimated on the basis of decision rules.

Neural networks (NN) are information processing systems constructed on the basis of biological neural systems having the capability to operate simultaneously in a shared way. Networks consist of interconnected, parallel functioning neurons, and gain their problem-solving capability by learning. Fundamental components of neural networks are the elementary neurons, which are organized in layers. Weighting of the networks is established through the learning process.

The advantages of the method are the few application assumptions, the intelligent learning of relationships and the universal approximation feature. Drawbacks are the black box problem, the accidental appearance of overtraining, arriving at local minima, the indirect determination of relative contributions and the inability to carry out statistical tests. Neural networks can automatically estimate probability of survival/bankruptcy values. If the solvent rate of the population and the sample substantially differs from each other, probability-calibration might be necessary.

It has been proven in some earlier publications (see i.e. *Ghiassi, Saidane, Zimbra,* 2005) that dynamic neural network models provide more accurate forecast and perform significantly better than traditional neural networks, like feedforward or backpropagation. For that reason the neural network model in the empirical research was trained by the exhaustive prune technique (*Huang, Saratchandran, Sundararajan*, 2005). With exhaustive prune, network training parameters are chosen to ensure a very thorough search of the space of possible models to find the best one.

Analytical aspects, reliability-examination methods

Theoretical and practical requirements demand the direct comparability of bankruptcy models constructed by different methods. This expectation can only be met if input data of modeling is exactly the same for each method, model outputs are measured on the same scale in the same intervals, and model performance is evaluated by the same reliability-examination methods. Identical input information is guaranteed in the empirical research.

It was drawn as a fundamental criterion towards forecast methods that all the three must result in probability of survival values between 0 and 1. Logistic regression and neural networks automatically meet this requirement. In case of the recursive partitioning algorithm probability of survival values were estimated from the classification capabilities of decision rules.

The requirement to determine the significance/relevance of certain variables presumes the exact measurement of relative contribution of the variables. It is easy to see that this measurement problem occurs when evaluating neural networks. The empirical research measured the importance of input neurons with the help of sensitivity analysis. In case of recursive partitioning algorithm it can only be concluded that the first partitioning variable has the highest contribution to the model performance.

It can be drawn as a general validity that reliability-examination is an equal-ranking task to making forecast (*Gáspár, Nováky,* 2002). In case of bankruptcy prediction it should not be hauled up from predictions whether they took place in reality, but whether they provided appropriate information to make the necessary decisions (e.g. credit appraisal).

It is expected from reliable bankruptcy models that they promote to avoid potentially unfavorable situations. Model validation reveals how well the models are performing (*Medema, Koning, Lensink,* 2009).

Reliability of forecast models is evaluated by using the *Receiver Operating Characteristic (ROC)* curve analysis. ROC curve is a useful analytical tool to evaluate the performance of classification rules in case of binary output and estimated probability values or scores (*Stein*, 2005). The ROC curve examines how reliable the estimated probabilities reflect the belonging to the output categories, if the a priori classification is known. The curve considers the observations in the sample in the sequence of their estimated probability of survival/bankruptcy. Horizontal axis represents the cumulative distribution of solvent and vertical axis the cumulative distribution of insolvent observations. The reference of ROC curve is the 45°-line, which represents random guessing. The evaluation of a bankruptcy model is better if its curve better drifts apart from the 45°-line (*Agarwal, Taffler,* 2007).

The area under ROC curve (AUROC) is an objective statistical indicator. If the AUROC exceeds 50% then it has an added value compared to random guessing. Model having higher AUROC means better model. It is an established custom of ROC analysis to estimate the 95% confidence interval of AUROC. When evaluating bankruptcy models the ROC curves and AUROCs of the total sample and the testing set are considered for each forecast method. It is also usual to evaluate model performance using the GINI coefficient.

Developed models

Bankruptcy prediction models were elaborated using the observations and variables after industrial mean correction. Each method was applied using the following strategies:

- entering the original variables,
- entering the original variables together with continuous PCA factors,
- entering the CHAID split original variables,

- entering the CHAID split original and PCA variables.

Logistic regression based models

In this empirical research the logistic regression models were constructed using the forward stepwise procedure. Variable selection was carried out by using the Wald entry and removal criteria. The entry criterion was defined as 5% and the removal criterion as 10% probability value.

Using the continuous financial ratios *the Logit model* contains four significant variables – two indebtedness, one size and one cash flow indicators – besides the constant. The final model was elaborated in eight steps. It is interesting that the dynamic profitability ratio was entered firstly and discarded in the last step in favor of the cash flow/liabilities ratio.

Table 1. **Main features of the logistic regression model**

Explanatory variable	**β**	**Standard error**	**Wald-test**	**p-value**
Long term indebtedness	-.830	.257	10.429	.001
Indebtedness	2.084	.358	33.816	.000
Net_revenue	-8.118	1.721	22.257	.000
Cash_flow_liabilities	-.073	.031	5.479	.019
Constant	-5.132	.656	61.119	.000

On the basis of statistical testing it is visible that regression parameters are significant until 98.1% level. Model testing was carried out with the help of the asymptotic χ^2 test based Omnibus-test. The value of χ^2 is 126.6 (degree of freedom: 4), the p-value is 0.000. Therefore the logistic regression model is regarded as significant at all level.

The PCA model kept the two indebtedness ratios, and replaced the net revenue and cash flow/liabilities ratios by the size and cash flow factors. For this reason higher model performance is expected, since the factors involve the impact of other variables (total

assets, dynamic profitability ratio), which might have added value to predict solvency. Like in the previous case the final model contains four variables.

Table 2. **Main features of the logistic regression model**

Explanatory variable	β	Standard error	Wald-test	p-value
Long term indebtedness	-.733	.247	8.804	.003
Indebtedness	1.836	.353	27.108	.000
PCA_SIZE	-1.131	.235	23.118	.000
PCA_CASH_FLOW	-.651	.249	6.817	.009
Constant	-3.045	.309	97.014	.000

Regression parameters are significant at 99.1% level. The value of χ^2 is 125.6 (degree of freedom: 4), the p-value is 0.000. Therefore the logistic regression model is regarded as significant at all level.

Using the CHAID split original variables, i.e. using the categorical variables a more diverse range of financial ratios were found to be significant. The first category of EBITDA margin has the strongest explanatory power which in itself expresses a 37% default rate (see Appendix 3). The inclusion of profitability, liquidity and growth ratios might inspire a better model performance compared to the models developed on the basis of continuous variables. The model is comprised of seven dummy variables.

Table 3. **Main features of the logistic regression model**

Explanatory variable	β	Standard error	Wald-test	p-value
CHAID_ROA_1	-1.822	.525	12.068	.001
CHAID_FIXED_ASSETS_DEBT_1	-1.009	.515	3.841	.050
CHAID_REVENUE_GROWTH_2	1.414	.479	8.712	.003
CHAID_EBITDA_MARGIN_1	-	.573	19.673	.000

	2.541			
CHAID_INDEBTEDNESS_1	2.065	.525	15.483	.000
CHAID_NET_REVENUE_1	-1.473	.551	7.154	.007
CHAID_CASH_LIQUIDITY_1	-1.831	.538	11.562	.001
Constant	.904	.657	1.894	.169

Regression parameters are significant at 95% level. The value of χ^2 is 171.2 (degree of freedom: 7), the p-value is 0.000. Therefore the logistic regression model is regarded as significant at all level.

Using the CHAID split original and PCA variables and through the availability of split PCA factors a similar model was resulted, however, instead of the fixed assets financed from debt and cash liquidity ratios the PCA_LEVERAGE factor was found to be significant, thereby making a six-variate model. Again the first category of the EBITDA margin is the strongest predictor, and the second one is the first category of the indebtedness ratio. Better model performance was expected compared to the two continuous ones, and similar to the previous categorical one.

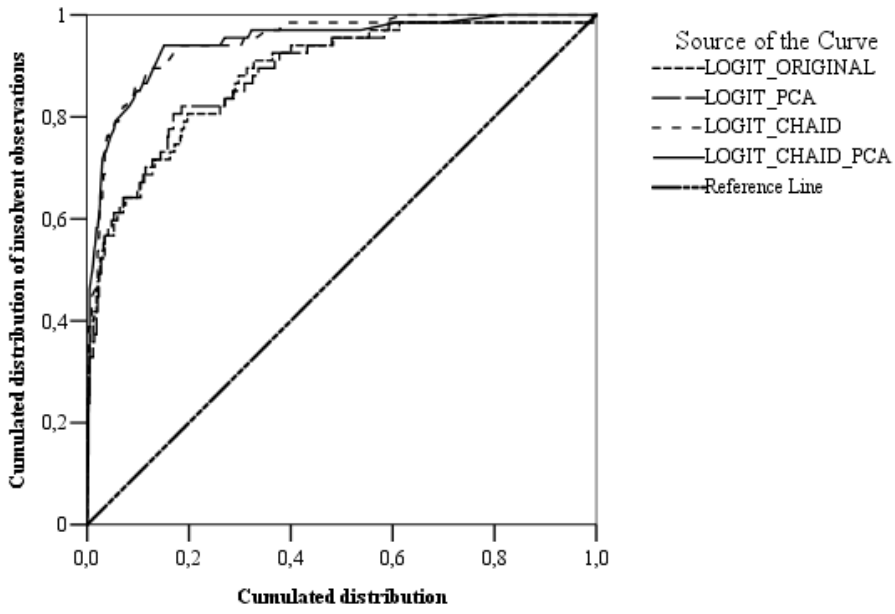
Table 4. **Main features of the logistic regression model**

Explanatory variable	**β**	**Standard error**	**Wald-test**	**p-value**
CHAID_ROA_1	-1.909	.520	13.461	.000
CHAID_REVENUE_GROWTH_2	1.333	.469	8.097	.004
CHAID_PCA_LEVERAGE_1	-1.803	.520	12.014	.001
CHAID_EBITDA_MARGIN_1	-2.847	.573	24.671	.000
CHAID_INDEBTEDNESS_1	2.118	.508	17.401	.000
CHAID_NET_REVENUE_1	-1.747	.549	10.117	.001
Constant	.631	.607	1.083	.298

Regression parameters are significant at 99.6% level. The value of χ^2 is 169.7 (degree of freedom: 6), the p-value is 0.000. Therefore the logistic regression model is regarded as significant at all level.

Comparing on the basis of the ROC curves it can be concluded that all the four models have favorable performance characteristics. Both the 88.5%-94.8% AUROC and the 77.0%-89.6% GINI indicators show excellent classification capabilities. All the ROC curves have sharp increasing sections in the beginning, proving that they can classify the most insolvent companies with very good accuracy.

Figure 1. **ROC curves of the logistic regression models**



It is also obvious that no clear distinction can be made between two-two models, namely between the two continuous and the two categorical models. The ROC curves often intersect each other and have very similar shapes. However, one thing is sure: both categorical models have better performance than the two continuous models. Hence it can be concluded on the basis of this empirical research that it is reasonable to apply univariate splitting in case of logistic regression, and factor analysis is not worth the trouble.

Table 5. **Model performance indicators (n=504)**

Model	AUROC (95% confidence interval)	GINI coefficient[1]
LOGIT_ORIGINAL	88.5% (83.9% – 93.0%)	77.0%
LOGIT_PCA	88.5% (83.9% – 93.0%)	77.0%
LOGIT_CHAID	94.8% (92.2% – 97.5%)	89.6%

LOGIT_CHAID_PCA	94.6% (91.5% – 97.7%)	89.2%

Another thing which proves the better applicability of CHAID-split models is the performance-difference of the training and the testing sets, however, such results must be handled with caution, since the testing set involves only 16 insolvent observations. The two continuous models have 91.1% and 91.5% AUROC on the training set and only 80.7% and 79.7% on the testing set, whereas the two categorical models 95.6% and 95.4% on the training set and 92.3% and 91.5% on the testing set. Therefore the continuous models are rather overtrained, and cannot be applied effectively on new observations. This is another reason for using the CHAID split models in practice.

Recursive partitioning algorithm based models

The decision tree built by the recursive partitioning algorithm went through a pruning procedure to avoid overtraining. The pruning procedure attempts to accomplish risk-minimization by defining different closing nodes. Increasing the number of closing nodes usually reduces the risk of specialization to the training set, and improves the cross-validation features of the model.

Decision tree pruning could be influenced by different stopping rules, which prevent from the further splitting of certain branches. Stopping rules can be defined for the minimum number of observations for the parent and the child branches as well. This can be expressed in absolute value and in the percent of observations in the training set. In the current empirical research the possibility of forming parent branch was set to the minimum 7% of the records within training set, and that of child branch was defined as minimum 5%. The models were constantly backtested on the testing set, and according to the results of tracking it was concluded that no more rigorous conditions were needed.

At the end of each decision rule classification can be done using the insolvent rates in the last nodes. The results can be interpreted as probability of bankruptcy/survival values. According to the idiosyncrasies of decision trees as many different probability of survival values are ordered to the observations as many kind of decision rule combinations exist in the tree structure.

Decision tree built using *the original variables and the training set* is illustrated in Figure 2. The first partitioning variable is the dynamic profitability ratio. Companies having worse than -3.026 value compared to the industrial mean face very high insolvent rate (62.2%). The second node splits further the middle-category using the natural logarithmic value of the total assets. It means that smaller companies are much riskier than larger companies in this dynamic profitability ratio category. The 260 best companies from the first viewpoint can be partitioned further using the cash liquidity ratio expressing that companies with good cash flow profitability and high cash liquidity are solvent in 99.5%. It is the indebtedness ratio which splits companies having good cash flow but low liquidity expressing that companies with lower indebtedness are less risky.

The model contains four variables and six final nodes. Cash flow, size, liquidity and indebtedness ratios were regarded as relevant[4] model variables, which is good from corporate financial viewpoints.

The availability of *PCA factors* has made substantial difference in the tree-building logic. The first partitioning variable is another cash flow variable, and again lower cash flow means riskier category. Interestingly the equity ratio became the second variable in two cash flow categories, and the PCA_LEVERAGE factor expressing long term indebtedness, capital coverage and cash ratio was found to be a good classifying variable for the middle cash flow category. The revenue growth managed to separate companies having low cash flow but high equity rate articulating that companies with higher revenue growth are less risky.

Figure 2. **Recursive partitioning algorithm based model**

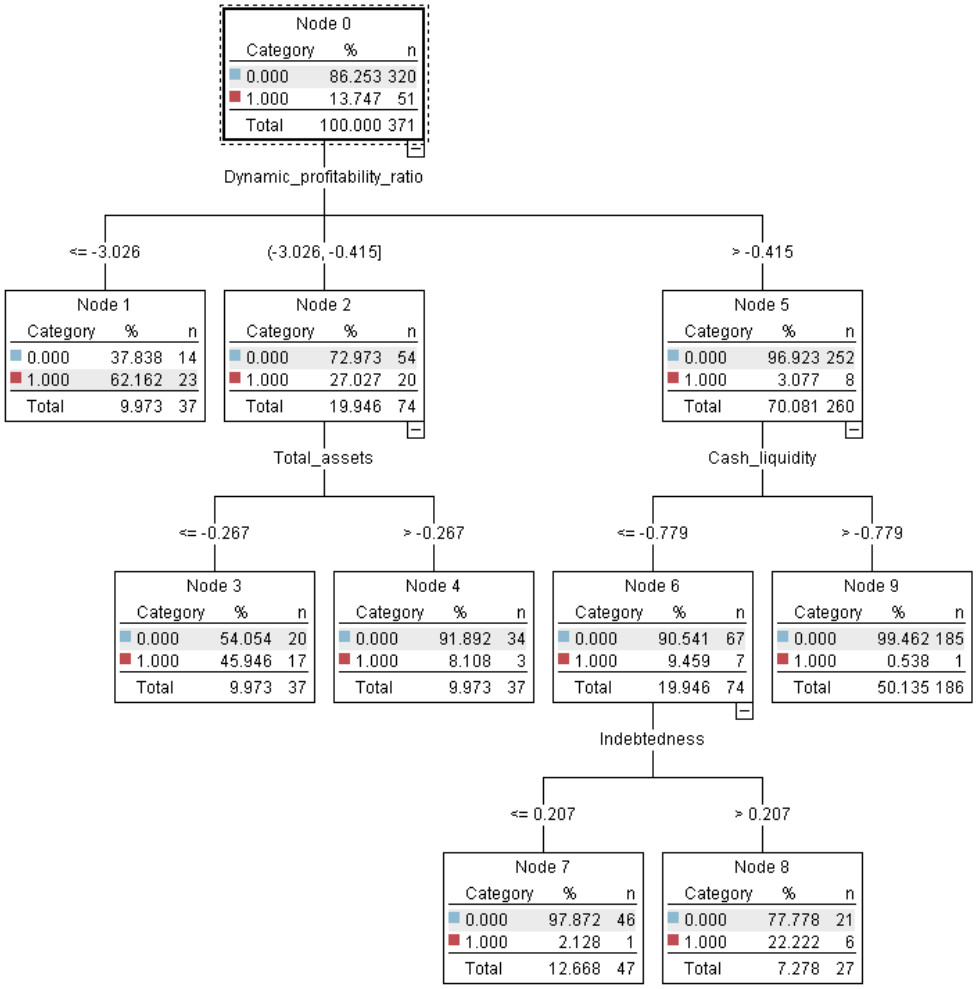
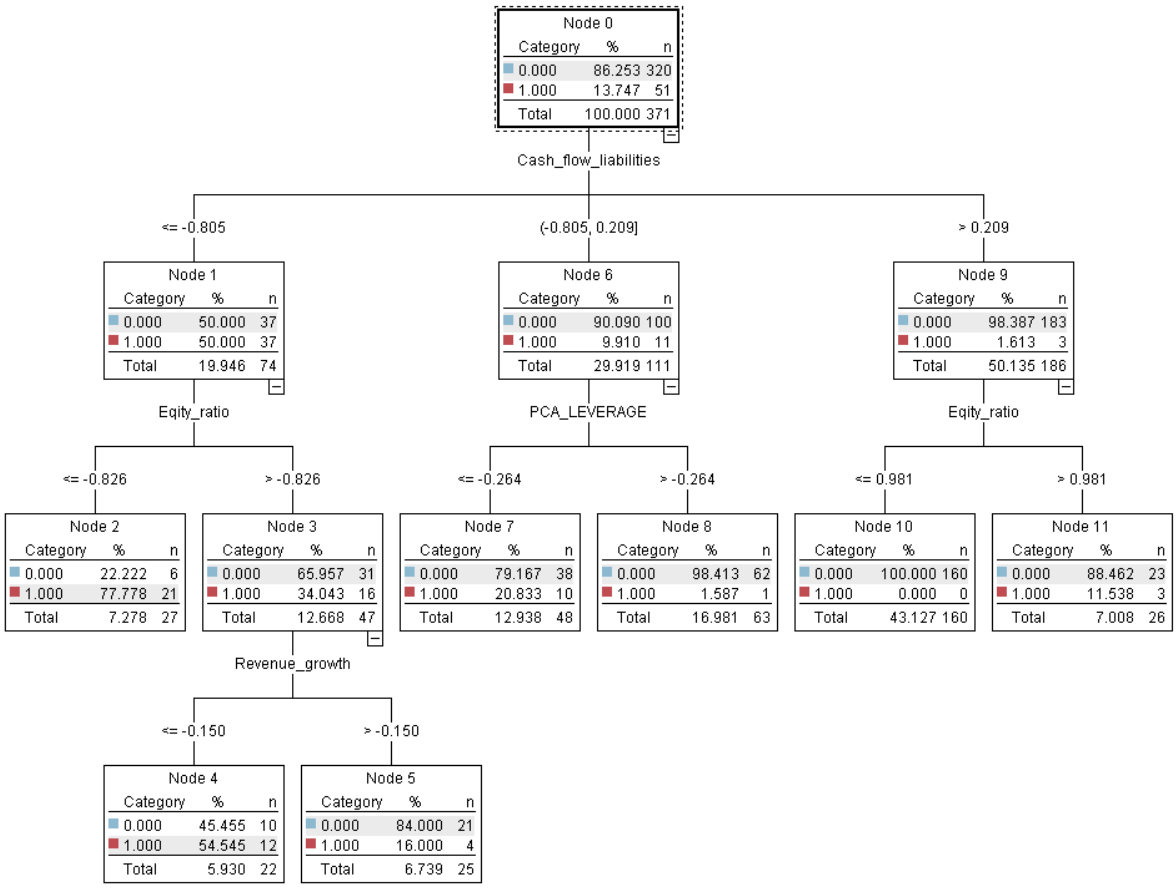


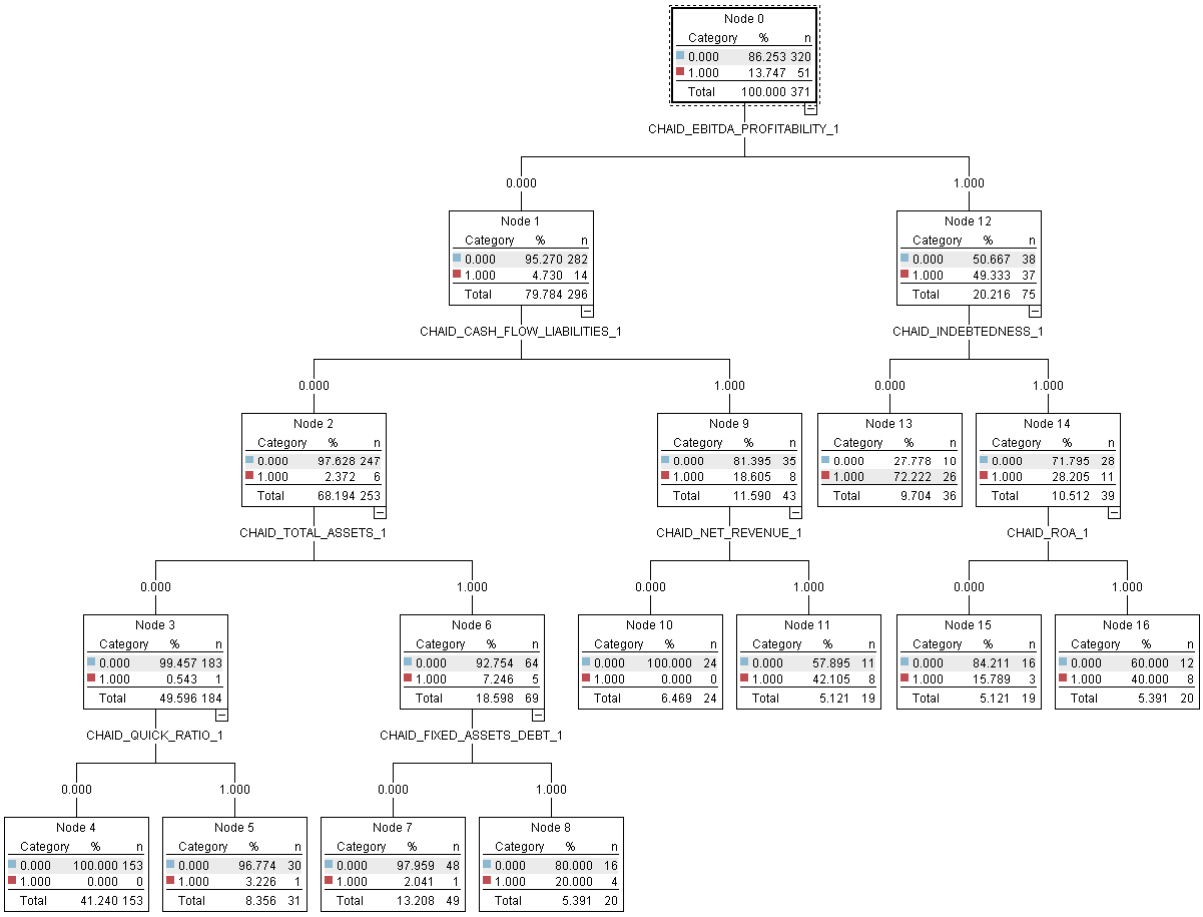
Figure 3. **Recursive partitioning algorithm based model**



The model contains four variables and seven final nodes. Cash flow, leverage and growth ratios were regarded as relevant model variables. The size indicators might be missing from corporate financial viewpoint. Due to the significantly differing trees it should be let to the ROC curves decide which model performs better.

Modeling with the CHAID split variables the RPA is like binary splitting. Only one category of a given variable is considered in one simulation step, and interestingly always the first categories were found to be relevant splitting variables. The EBITDA profitability became the first partitioning variable and the tree-depth achieved five levels.

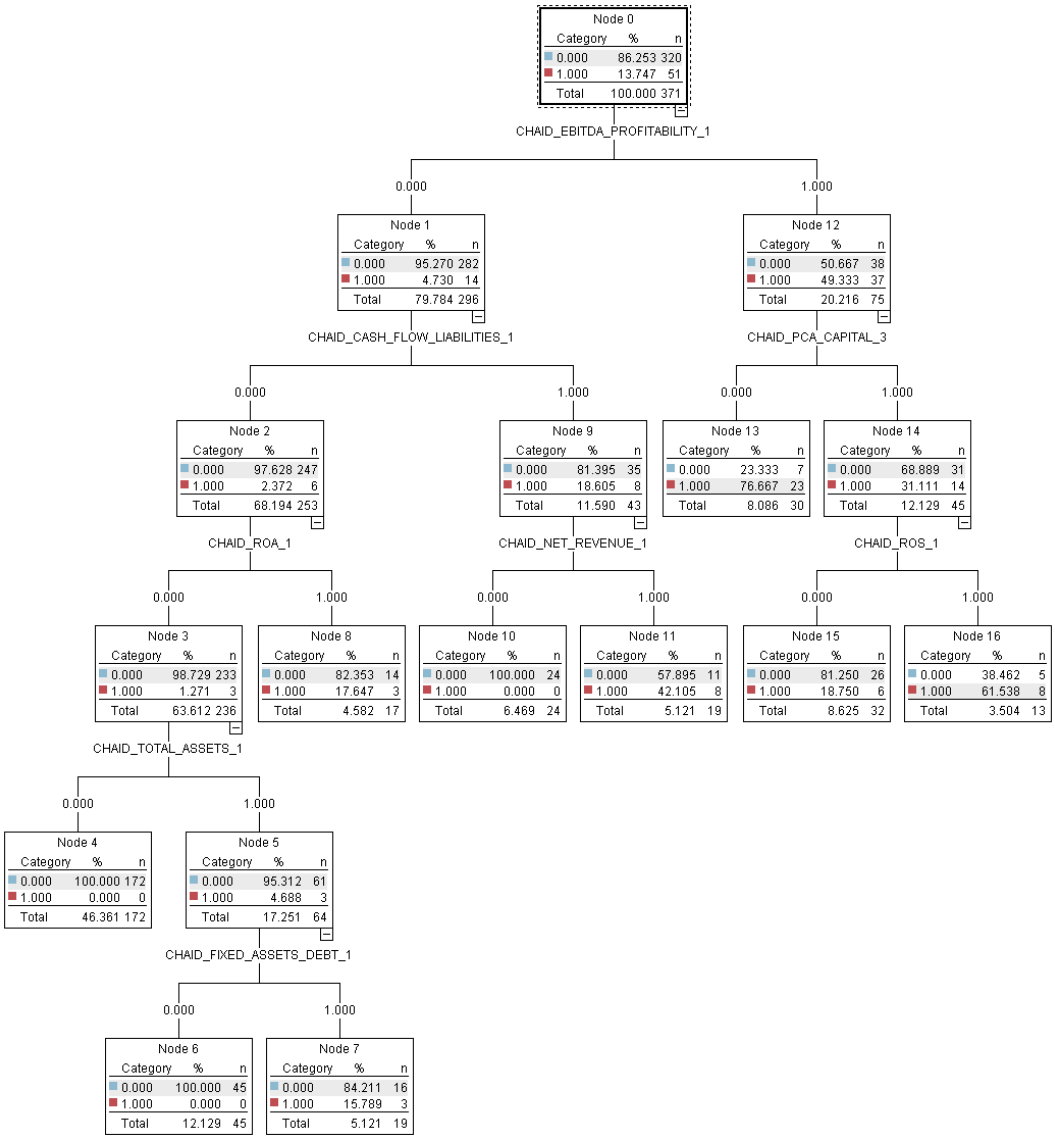
Figure 4. **Recursive partitioning algorithm based model**



The model contains eight variables and nine final nodes. EBITDA, cash flow, indebtedness, size, profitability and liquidity ratios were regarded as relevant model variables, which is very good from corporate financial perspectives. Higher model performance is expected compared to the continuous models.

Supplementary using the CHAID split factors the tree is somewhat similar to the previous model. Again the EBITDA profitability became the first partitioning variable; however, companies having unfavorable EBITDA are split further by *the PCA_CAPITAL factor* expressing equity, indebtedness and working capital rates. From that viewpoint the logic resembles the previous decision tree, since there the indebtedness ratio filled this role. Liquidity ratios disappeared from this model, however, ROS turned up.

Figure 5. **Recursive partitioning algorithm based model**

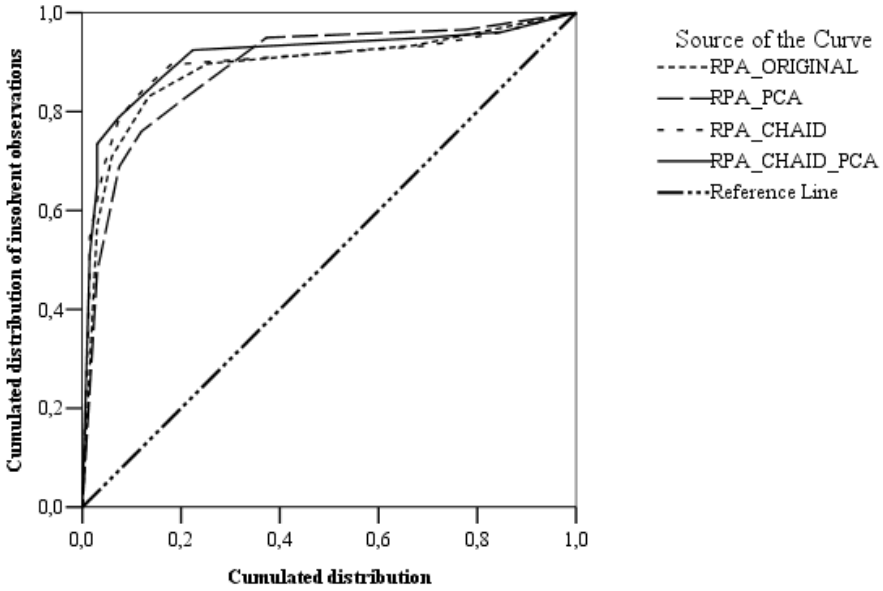


The model contains eight variables and nine final nodes. EBITDA, cash flow, indebtedness, leverage, size and profitability ratios were regarded as relevant model variables, which is very good from corporate financial aspects. Similar model performance is expected compared to the previous model.

On the basis of the ROC curves it can be concluded that the continuous models have similar or somewhat better performance characteristics than the logistic regression models. Performance indicators show very good classification capabilities. However, it

is very hard to decide on the best RPA model, since all the ROC curves intersect one another.

Figure 6. **ROC curves of the RPA models**



Under such circumstances three viewpoints can be considered: first, which is the steepest curve in the section of the first twenty probability of survival percentiles demonstrating that this model classifies the most insolvent companies with the best accuracy, second, which has the greatest AUROC, and third, which model is least overtrained.

Table 6. **Model performance indicators (n=504)**

Model	AUROC (95% confidence interval)	GINI coefficient
RPA_ORIGINAL	88.8% (85.1% – 92.6%)	77.6%
RPA_PCA	88.9% (84.8% – 92.9%)	77.8%
RPA_CHAID	89.8% (86.4% – 93.1%)	79.6%
RPA_CHAID_PCA	91.1% (87.9% – 94.3%)	82.2%

From all the three perspectives the decision tree containing categorical original and PCA variables is the best. The CHAID_PCA model has 94.2% AUROC on the training set and 86.4% on the testing set. The most overtrained model is the continuous PCA

model (92.0% AUROC on the training set and 78.4% on the testing set). Therefore it can be concluded on the basis of this empirical research that it is reasonable to apply both data reduction and univariate splitting in case of recursive partitioning algorithm, however, even the best RPA model has slightly worse performance characteristics compared to the best Logit model.

Neural network based models

The neural networks were trained by the exhaustive prune technique. The exhaustive prune technique starts from a network containing all independent variables as input neurons and having a great number of neurons in the hidden layers. Weights initially take random values. In the training epochs the procedure attempts to exclude neurons having low explanatory power from the input and the hidden layers. During training final weights are estimated very thoroughly by trying and validating several network-structures simultaneously. Temporarily it might be necessary to take back some neurons into the layers. This procedure has much more computation-requirements than the traditional procedures using predefined structure; however, according to experiences it provides the best results. To avoid overtraining weights estimated on the basis of training set are constantly backtested on the testing set. Final model weights are saved when achieving the highest classification accuracy on the testing set.

Using the original variables the exhaustive prune training found two hidden layers to be necessary. Five neurons remained in the input layer; the first hidden layer consists of two, and the second hidden layer of one neuron. In case of bankruptcy prediction the output layer evidently contains one neuron.

The relative contribution of neural network model variables can be estimated by sensitivity analysis. As a result of sensitivity analysis a value of importance between 0 and 1 is provided, where higher value means higher level of contribution to the predictive power of the model. The importance of the five variables in the input layer was the followings.

Table 7. **Relative importance of model variables**

Model variable	Value of importance
Dynamic profitability ratio	0.6894
Indebtedness	0.5998
Working capital ratio	0.5678
Net revenue	0.5149
Capital coverage	0.2890

Cash flow, indebtedness, capital structure and size indicators are considered in the model, which is good from corporate financial point of view.

The availability of *PCA factors* arrived at a bit more complicated model. The exhaustive prune training technique found again two hidden layers to be necessary. The input layer kept 9 neurons, the first and the second hidden layer includes 3-3 neurons. Instead of cash flow and size indicators the PCA_CASH_FLOW and the PCA_SIZE factors were entered into the model. Cash flow and indebtedness are the two most important variables, like in many other models.

Table 8. **Relative importance of model variables**

Model variable	Value of importance
PCA_CASH_FLOW	0.7813
Indebtedness	0.7467
PCA_SIZE	0.4812
Current assets ratio	0.3743
ROA	0.2033
EBITDA profitability	0.1835
Capital coverage	0.1762
Leverage	0.1671
Dynamic liquidity	0.0954

Beyond the previous model profitability, leverage and liquidity ratios can also be found. For that reason it is expected that the PCA model performs better than the one with original variables.

Using *the CHAID split original variables* a quite manageable network was created. The input layer encloses 7, the first hidden layer 1 and the second hidden layer 3 neurons.

Table 9. **Relative importance of model variables**

Model variable	Value of importance
CHAID_ROA_1	0.1129
CHAID_INDEBTEDNESS_2	0.1067
CHAID_REVENUE_GROWTH_2	0.1065
CHAID_EBITDA_MARGIN_2	0.0925
CHAID_CASH_LIQUIDITY_2	0.0653
CHAID_LONG_TERM_INDEBTEDNESS_1	0.0596
CHAID_EBITDA_MARGIN_1	0.0219

Profitability, indebtedness, growth, EBITDA and liquidity indicators are considered in the model, which is acceptable from corporate financial point of view. The EBITDA can replace the impact of cash flow ratios, only the size ratios can be missed from the model.

Supplementary using *the CHAID split PCA factors* a high number of neurons remain in the input layer (16). The two hidden layers contain two-two neurons. The model extensively used the split PCA factors. The low ROA category became the most relevant variable.

Table 10. **Relative importance of model variables**

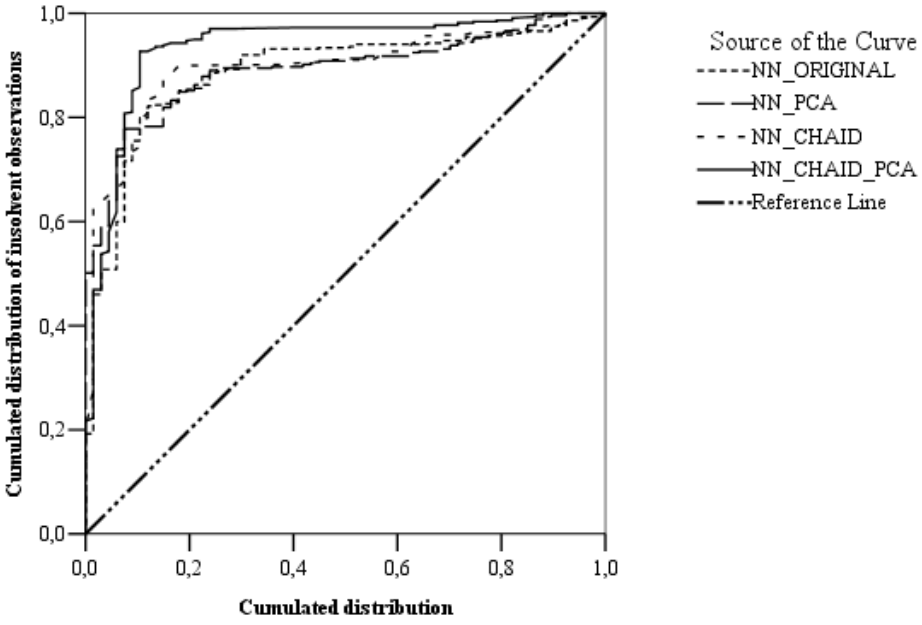
Model variable	Value of importance
CHAID_ROA_1	0.0581
CHAID_EBITDA_MARGIN_2	0.0572

CHAID_LONG_TERM_INDEBTEDNESS_1	0.0571
CHAID_PCA_LEVERAGE_2	0.0426
CHAID_PCA_SIZE_2	0.0423
CHAID_DYNAMIC_PROFITABILITY_3	0.0406
CHAID_REVENUE_GROWTH_2	0.0396
CHAID_EBITDA_MARGIN_1	0.0369
CHAID_INDEBTEDNESS_1	0.0317
CHAID_PCA_CAPITAL_3	0.0271
CHAID_REVENUE_GROWTH_1	0.0144
CHAID_PCA_LEVERAGE_1	0.0137
CHAID_PCA_SIZE_1	0.0097
CHAID_INDEBTEDNESS_2	0.0097
CHAID_DYNAMIC_LIQUIDITY_1	0.0055
CHAID_PCA_CAPITAL_1	0.0036

Profitability, EBITDA, indebtedness, leverage, size, cash flow, growth, capital structure, and liquidity indicators are considered in the model, which is excellent from corporate financial point of view. Only the simultaneous presence of PCA_CAPITAL and both indebtedness categories is very hard to explain, despite the fact that the third category of PCA_CAPITAL contains the 80% best observations, whereas indebtedness categories are split in the share of 60%-40%. Even with this problem high model performance was expected.

On the basis of the ROC curve analysis it can be concluded that the performance of three models practically cannot be distinguished, since the ROC curves intersect one another and the AUROC indicators have little difference: the two continuous models and the CHAID split model. However, each model possesses good classification capabilities. The ROC curve of the CHAID_PCA model “covers” the others almost in the total probability of survival percentile range and has the highest AUROC, therefore this is the best model.

Figure 7. **ROC curves of the neural network models**



As far as overtraining is concerned the continuous PCA model shows the greatest sign to be overtrained, since its AUROC is 90.8% on the training set and 83.1% on the testing set. The CHAID_PCA model provides the best result on the testing set (AUROC=87.7%).

Table 11. **Model performance indicators**

Model	AUROC (95% confidence interval)	GINI coefficient
NN_ORIGINAL	88.7% (84.8% – 92.6%)	77.4%
NN_PCA	89.1% (85.9% – 92.3%)	78.2%
NN_CHAID	89.6% (86.2% – 93.0%)	79.2%
NN_CHAID_PCA	93.5% (90.1% – 96.9%)	87.0%

On the basis of empirical research it seems that in case of neural networks it is advisable to apply together data reduction and univariate splitting. Furthermore it has to be also remembered that even the best neural network model underperforms the best logistic regression model.

Conclusions

Using the experiences of constructing 12 bankruptcy models on the same Hungarian corporate database it can be concluded that data reduction and univariate partitioning do make sense in the field of bankruptcy prediction. All the elaborated models are acceptable from corporate financial aspects, and all of them possess high classification power. On the basis of model performances it can be argued that *univariate splitting adds more value to model improvement than data reduction*.

On the basis of AUROC indicators a sequence can be set to the classification power of elaborated models. In this sense the two categorical logistic regression models are the best ones, and they are followed by the CHAID_PCA neural network model, and then comes the CHAID_PCA decision tree.

It is interesting to note that no difference can be reported between the reliability of the three forecast methods when using the original continuous variables despite the relatively small sample and the perceived superiority of neural networks in several other comparative empirical researches. *It is also clear that based on this empirical research that PCA in itself does not substantially improve predictive power, and might result in more overtrained models.*

Studying the stability of the developed models it can be asserted that the application of CHAID split categorical variables results in less overtrained models, hence more stable models can be developed with the help of univariate splitting.

The dilemma whether the simultaneous application of data reduction and univariate splitting can be recommended for modeling practitioners is not resolved unambiguously. It is reasonable to do so in the case of recursive partitioning algorithm and neural networks, however, in case of logistic regression the CHAID splitting in itself has very favorable impact, and PCA does not have added value at all. *The simultaneous application is mostly recommended for neural network practitioners.*

Appendix 1 – Name and calculation formula of the applied financial ratios

Name of ratio	Calculation formula
Return on equity (ROE)	Profit after tax / Average equity
Return on assets (ROA)	Profit after tax / Average total assets
Return on sales (ROS)	Operating income / Net sales revenue
EBITDA margin	(Operating income + Depreciation) / Net sales revenue
EBITDA profitability	(Operating income + Depreciation) / Average total assets
Assets turnover	Net sales revenue / (Average total assets / 365)
Inventory turnover	Net sales revenue / (Average inventory / 365)
Trade receivables turnover	Net sales revenue / (Average trade receivables / 365)
Equity ratio	Equity / Total assets
Long term indebtedness	Long term liabilities / (Equity + Long term liabilities)
Fixed assets financing	Equity / Fixed assets
Indebtedness	Liabilities / Total assets
Leverage	Liabilities / Equity
Fixed assets financed from debt	Long term liabilities / Fixed assets
Capital coverage	(Fixed assets + Inventory) / Equity
Current assets ratio	Current assets / Total assets
Cash ratio	(Cash and cash equivalents + Securities) / Current assets
Working capital ratio	(Current assets - Short term liabilities) / Total assets
Current ratio	Current assets / Short term liabilities
Quick ratio	(Current assets - Inventory) / Short term liabilities
Cash liquidity	(Cash and cash equivalents + Securities) / Short term liabilities
Dynamic liquidity	Operating income / Short term liabilities
Trade receivables / Trade payables	Trade receivables / Trade payables
Dynamic profitability ratio	(Profit after tax + Depreciation) / Average total assets
Cash flow / Liabilities	(Profit after tax + Depreciation) / (Long term liabilities + Short term liabilities)
Cash flow / Net sales revenue	(Profit after tax + Depreciation) / Net sales revenue
Total assets	ln (Total assets)
Net sales revenue	ln (Net sales revenue)
Net sales revenue growth	Net sales revenue actual period / Net sales revenue previous period
Operating income growth	Operating income actual period / Operating income previous period
Profit after tax growth	Profit after tax actual period / Profit after tax previous period

Appendix 2 – Factor equations

PCA_REVENUE = 0.04604 + 0.00002253×ROS + 0.0001337×EBITDA_margin + 0.0005592×Cash_flow_revenue
Eigenvalue: 2.999
KMO: 73.2%
Total variance explained: 99.964%

PCA_ASSETS_TURNOVER = -0.2236 + 0.4252×Assets_turnover + 0.7908×Current_assets_ratio
Eigenvalue: 1.421
KMO: 50.0%
Total variance explained: 71.063%

PCA_SIZE = 2.167 + 4.359×Total_assets + 4.118×Net_revenue
Eigenvalue: 1.894
KMO: 50.0%
Total variance explained: 94.686

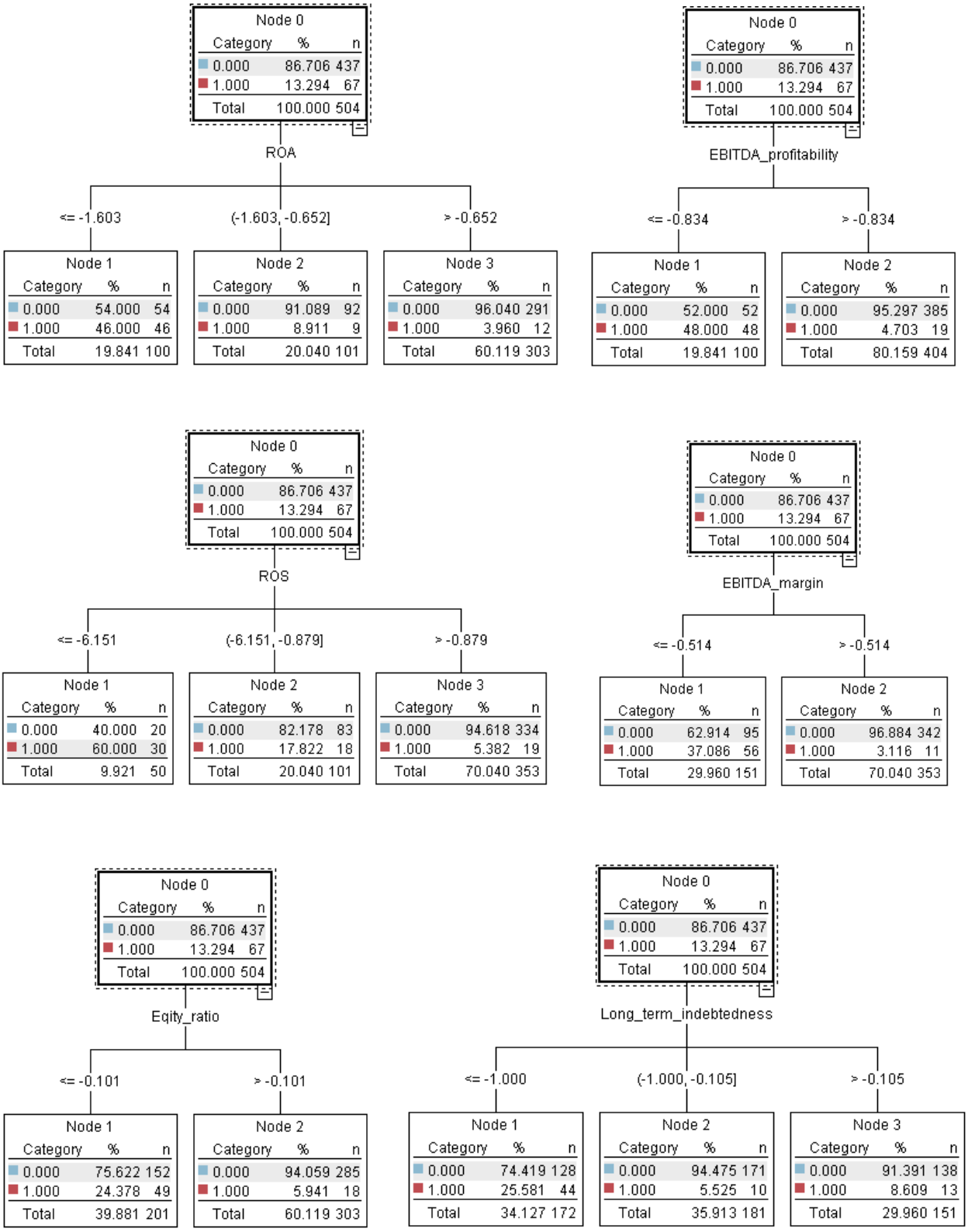
PCA_CASH_FLOW = 0.001201 + 0.1387×Dynamic_profitability_ratio + 0.05488×Cash_flow_liabilities
Eigenvalue: 1.427
KMO: 50.0%
Total variance explained: 71.344

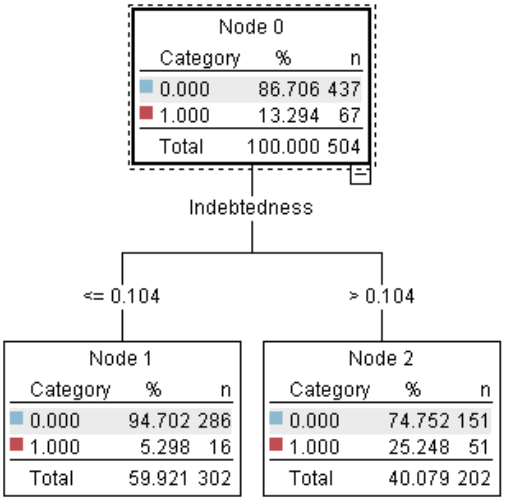
PCA_LIQUIDITY = -0.1561 + 0.07052×Current_ratio + 0.05577×Quick_ratio + 0.02629×Cash_liquidity + 0.007302×Trade_receivables_trade_payables
Eigenvalue: 2.891
KMO: 69.1%
Total variance explained: 72.282

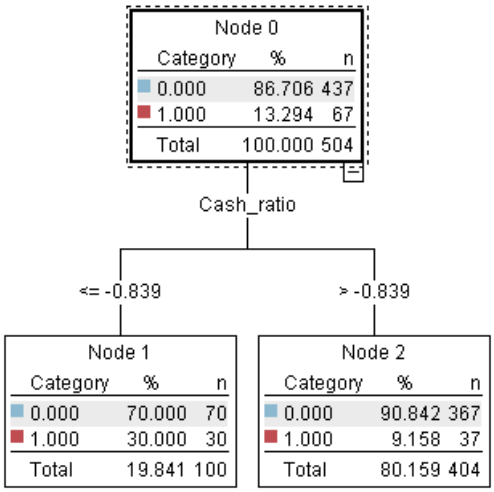
PCA_CAPITAL = 0.06037 + 0.1937×Equity_ratio – 0.2464×Indebtedness + 0.01361×Working_capital_ratio
Eigenvalue: 2.084
KMO: 54.7%
Total variance explained: 69.476

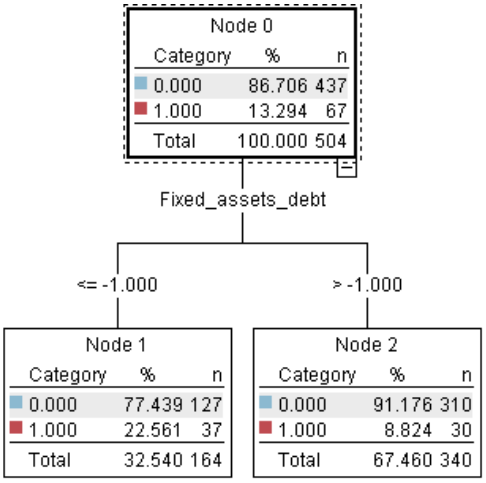
PCA_LEVERAGE = -0.05667 + 0.01232×Long_term_indebtedness – 0.005985×Capital_coverage + 0.2839×Cash_ratio
Eigenvalue: 1.390
KMO: 52.1%
Total variance explained: 46.330

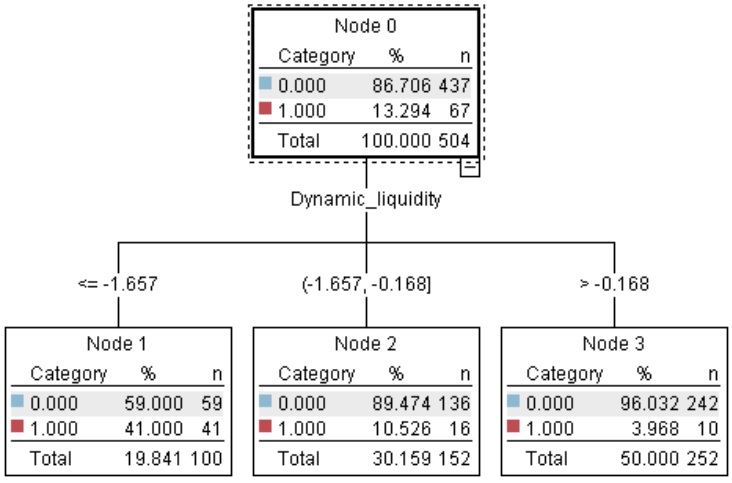
Appendix 3 – Univariate CHAID decision trees

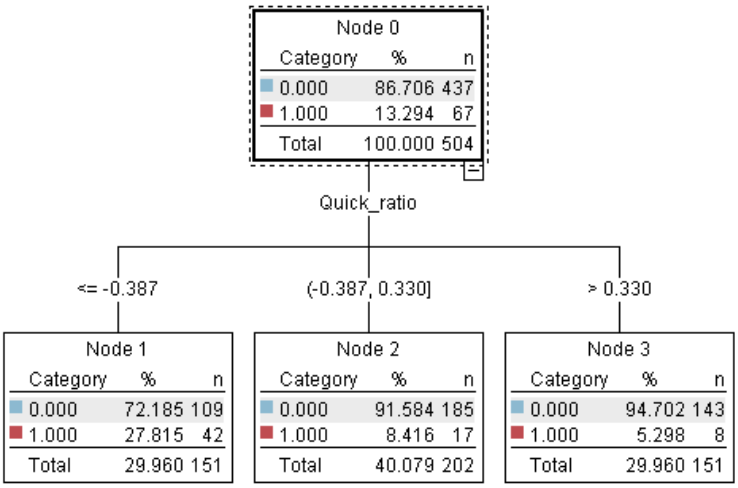


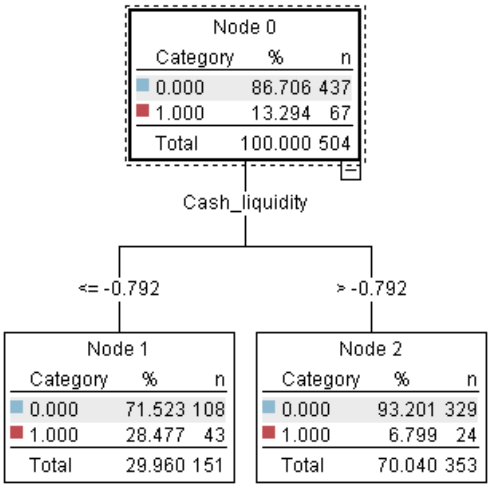

Node 0
Category % n
0.000 86.706 437
1.000 13.294 67
Total 100.000 504
Indebtedness
<= 0.104
> 0.104
Node 1
Category % n
0.000 94.702 286
1.000 5.298 16
Total 59.921 302
Node 2
Category % n
0.000 74.752 151
1.000 25.248 51
Total 40.079 202


Node 0
Category % n
0.000 86.706 437
1.000 13.294 67
Total 100.000 504
Cash_ratio
<= -0.839
> -0.839
Node 1
Category % n
0.000 70.000 70
1.000 30.000 30
Total 19.841 100
Node 2
Category % n
0.000 90.842 367
1.000 9.158 37
Total 80.159 404

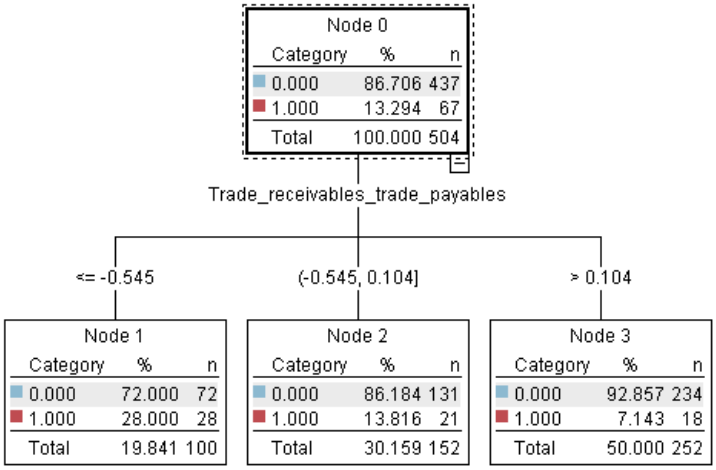

Node 0
Category % n
0.000 86.706 437
1.000 13.294 67
Total 100.000 504
Fixed_assets_debt
<= -1.000
> -1.000
Node 1
Category % n
0.000 77.439 127
1.000 22.561 37
Total 32.540 164
Node 2
Category % n
0.000 91.176 310
1.000 8.824 30
Total 67.460 340

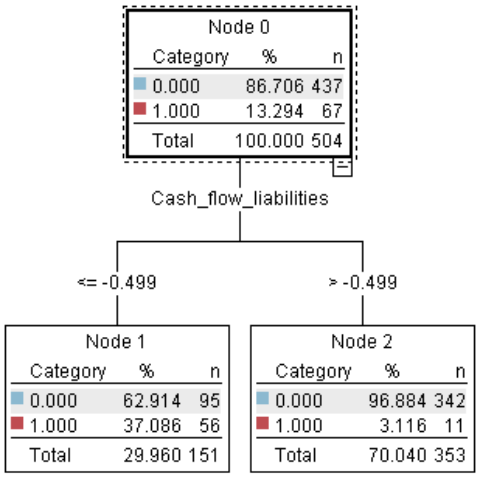

Node 0
Category % n
0.000 86.706 437
1.000 13.294 67
Total 100.000 504
Dynamic_liquidity
<= -1.657
(-1.657, -0.168]
> -0.168
Node 1
Category % n
0.000 59.000 59
1.000 41.000 41
Total 19.841 100
Node 2
Category % n
0.000 89.474 136
1.000 10.526 16
Total 30.159 152
Node 3
Category % n
0.000 96.032 242
1.000 3.968 10
Total 50.000 252

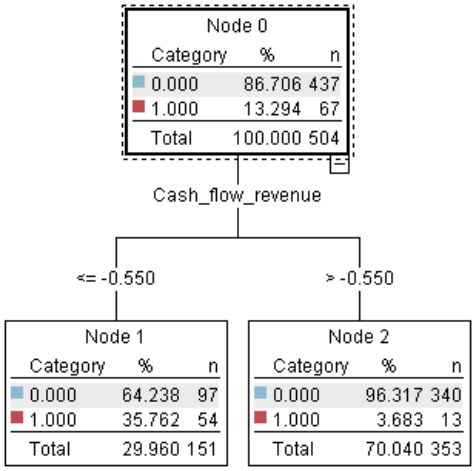

Node 0
Category % n
0.000 86.706 437
1.000 13.294 67
Total 100.000 504
Quick_ratio
<= -0.387
(-0.387, 0.330]
> 0.330
Node 1
Category % n
0.000 72.185 109
1.000 27.815 42
Total 29.960 151
Node 2
Category % n
0.000 91.584 185
1.000 8.416 17
Total 40.079 202
Node 3
Category % n
0.000 94.702 143
1.000 5.298 8
Total 29.960 151

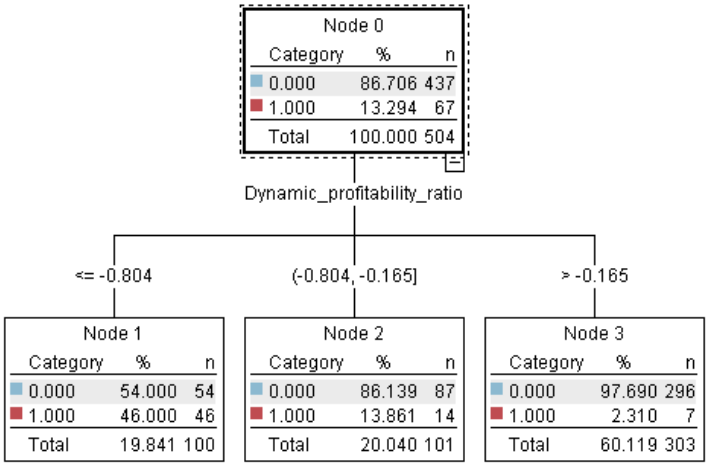

Node 0
Category % n
0.000 86.706 437
1.000 13.294 67
Total 100.000 504
Cash_liquidity
<= -0.792
> -0.792
Node 1
Category % n
0.000 71.523 108
1.000 28.477 43
Total 29.960 151
Node 2
Category % n
0.000 93.201 329
1.000 6.799 24
Total 70.040 353

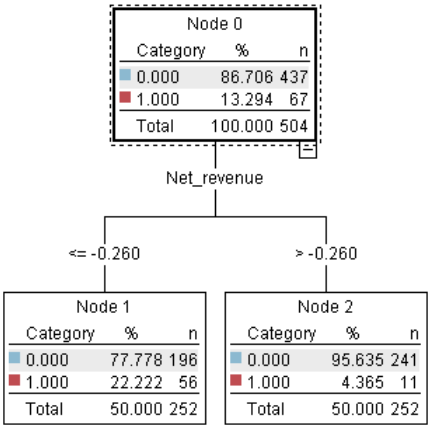
Data Reduction and Univariate Splitting – Do They Together Provide Better Corporate Bankruptcy Prediction?

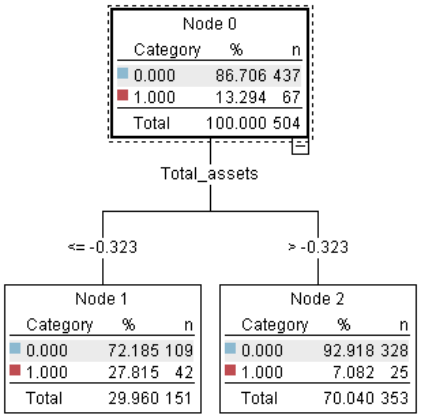


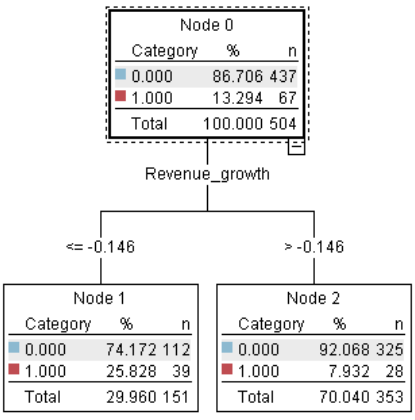


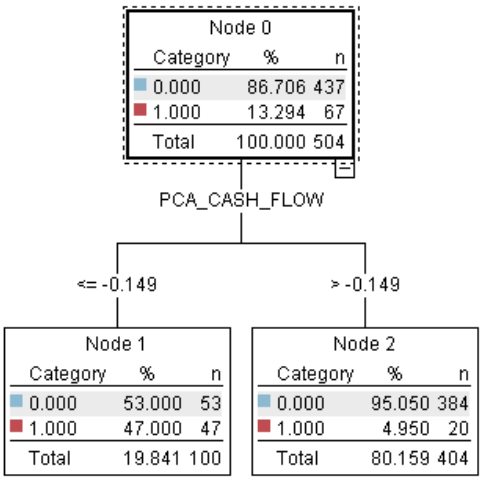


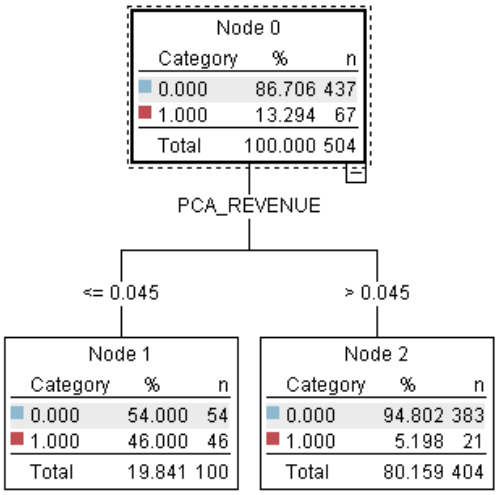


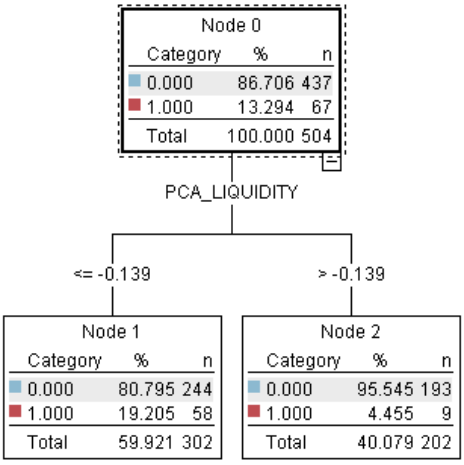


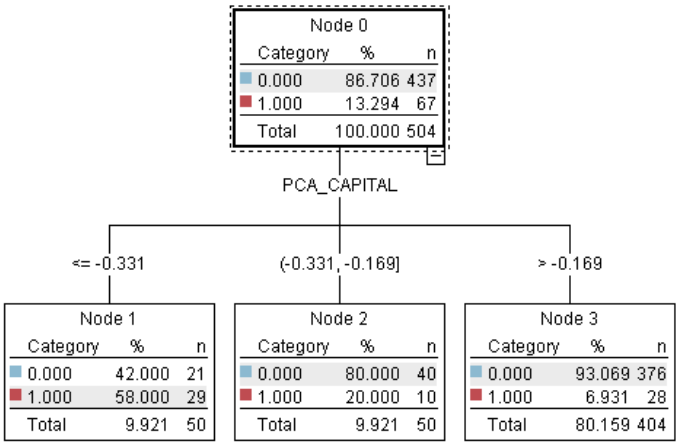


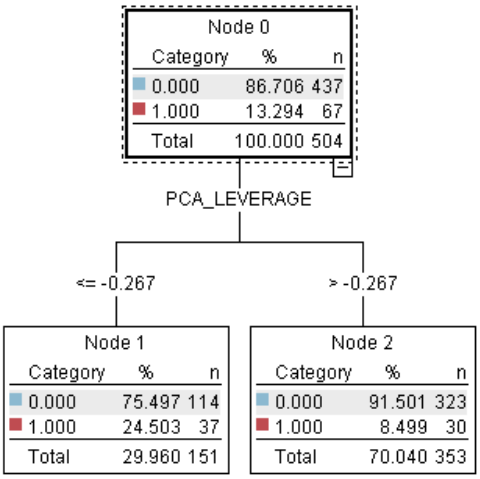


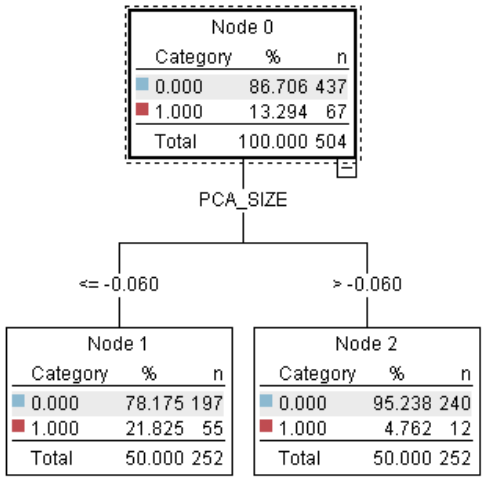

Node 0
Category % n
0.000 86.706 437
1.000 13.294 67
Total 100.000 504
PCA_CASH_FLOW
<= -0.149
> -0.149
Node 1
Category % n
0.000 53.000 53
1.000 47.000 47
Total 19.841 100
Node 2
Category % n
0.000 95.050 384
1.000 4.950 20
Total 80.159 404


Node 0
Category % n
0.000 86.706 437
1.000 13.294 67
Total 100.000 504
PCA_REVENUE
<= 0.045
> 0.045
Node 1
Category % n
0.000 54.000 54
1.000 46.000 46
Total 19.841 100
Node 2
Category % n
0.000 94.802 383
1.000 5.198 21
Total 80.159 404


Node 0
Category % n
0.000 86.706 437
1.000 13.294 67
Total 100.000 504
PCA_LIQUIDITY
<= -0.139
> -0.139
Node 1
Category % n
0.000 80.795 244
1.000 19.205 58
Total 59.921 302
Node 2
Category % n
0.000 95.545 193
1.000 4.455 9
Total 40.079 202


Node 0
Category % n
0.000 86.706 437
1.000 13.294 67
Total 100.000 504
PCA_CAPITAL
<= -0.331
(-0.331, -0.169]
> -0.169
Node 1
Category % n
0.000 42.000 21
1.000 58.000 29
Total 9.921 50
Node 2
Category % n
0.000 80.000 40
1.000 20.000 10
Total 9.921 50
Node 3
Category % n
0.000 93.069 376
1.000 6.931 28
Total 80.159 404


Node 0
Category % n
0.000 86.706 437
1.000 13.294 67
Total 100.000 504
PCA_LEVERAGE
<= -0.267
> -0.267
Node 1
Category % n
0.000 75.497 114
1.000 24.503 37
Total 29.960 151
Node 2
Category % n
0.000 91.501 323
1.000 8.499 30
Total 70.040 353


Node 0
Category % n
0.000 86.706 437
1.000 13.294 67
Total 100.000 504
PCA_SIZE
<= -0.060
> -0.060
Node 1
Category % n
0.000 78.175 197
1.000 21.825 55
Total 50.000 252
Node 2
Category % n
0.000 95.238 240
1.000 4.762 12
Total 50.000 252

Notes

1 In Hungary, for instance, the number of newly declared bankruptcy procedures, liquidation procedures and winding ups was doubled in 2008 compared to 2000, and it exceeded the level of 2007 by 14 percent.

2 This procedure is also called as Classification and Regression Trees (CRT).
3 GINI = (2×AUROC) – 1.

4 Term 'significance' does not make sense in case of simulation procedures.

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