THE WORLD OF ORDER – BASICS OF THE SYSTEMS SCIENTIFIC BACKGROUND AND A PRACTICAL APPLICATION OF *ZIEGLER-SYSTEMCOACHING*

Éva Ziegler

System-engineer, system-scientist, researcher of Ziegler Consulting, guest lecturer of Széchenyi István University Győr

eva.ziegler@zieglercons.com

Abstract

Systemcoaching Methodology is the result of theoretical research, development and several decades of practical work. The methodology consists of three areas: 1) Systems science-based knowledge 2) A strong, but easy-to-handle model, the SGS Model (System in Gross-Systems) and 3) The simple, but strict and consequent method, the SnF Method (Squares and Frames). The methodology helps in the creation of a horizontal map of our complex, multiple related, multi-contiguous overlapping gross-systems. *Systemcoaching* does not imply value judgement on users. It shows, how far is the real target status of an S system in a certain GS_i gross-system from the own imaginary objectives. The methodology finds and lists iteratively the consequently necessary actions within the time/material/energy frames. It is very flexible, it can be combined with all kinds of other consequent and correct methods, which are not contradicting the rules of physics and system science.

Keywords: Systemcoaching, complex systems, RPA, new methodology, change management

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1. THE ANTECEDENTS OF *SYSTEMCOACHING* METHODOLOGY

Challenges due to evolution of globalization and communication

The rapid changes in globalization of social processes and the rapid technological evolution of communication have been accelerating each other over the last decades. And we do not even see the end of the process, even the hope of slowing down the acceleration. Because of the above, the human challenges are more and more difficult to meet *harmoniously*. At both organizational and individual levels. It is further complicated by the fact that human capital tasks require increasing levels of knowledge. The quality of trainings, aiming to provide harmonious operational capabilities – apart from some outstanding educational islands – have highly diverse levels, and the trainings lag the trend lines.

Facing the challenge of robots: The spread of "Robotic Process Automation (RPA)"

The dual issue outlined in the first point (harmony and knowledge) became the driving force behind leadership science and practical management. But the impact of the newest challenge nowadays – the new forms of robots and automation in bulk breaking into common workplaces – became a real and inevitable problem at daily work. Whether they are robots with mechanical arms, or the knowledge of an administrative employee embedded in complex administrative software. Now, we have come to the moment I have been always predicting since decades, during my system-research work on every scientific forum, conferences, and to every client:

- On the one hand, we all must understand based *on natural sciences* how the real world operates. Including control, automation and robots.
- On the other hand, based *on the social sciences*, we need to find the best answers, the best methodologies for the harmonious acceptance of human-world-robot relationships, embedding in human relationships, in a precise and appropriate way.

How systems science can help – namely the real physics + the imaginary information-science + the connecting control-science – in this?

In two key areas:

1. *Knowledge*: On the one hand, although we have a major influence of the systems science on our everyday operation, our management work, our strategic and tactical considerations, our communication, but for everyday heroes it is mainly unknown, due to the difficulty of the necessary mathematical apparatus. But we can transfer the necessary knowledge with another very common and useful tool: with the words of the language. (*Ziegler 2013a*)
2. *New models and methods*: On the other hand, to develop new operating, thinking models and methods, based on real and accurate system knowledge, respecting and constructively utilizing the operating rules of the real systems, which are significantly different in many ways from the practical methodologies so far. (*Ziegler 2014*)

Hereinafter, I outline the basics of such a method that satisfies the above goals, keeping it simple and robust. I have developed the *Systemcoaching Methodology* as a result of my practical, professional experience in the senior management and advisory functions of major international companies and as a result of my system research work as a cybernetic engineer. (Specifically, according to Dr Professor József Poor's recommendation: *Ziegler-Systemcoaching Methodology*.)

The three pillars of *Systemcoaching Methodology*

1. Exact theoretical basics
2. Model, built on the exact basics: „System in Gross-Systems" (SGS)

3. Method, built on the system model, the easy-to-handle „Squares and Frames" (SnF) method

When speaking about an "easy-to-handle" method, – despite the complexity of exact theoretical basics and the roughly thirty years of practical management work in designing the method, – we also think about a simple method. To get the first meaningful results, it is enough to have some square grid papers, a pencil and common sense. On the user's demand, an excel-table or something similar can be used, but these are not mandatory prerequisites, just options.
What is less simple: The deeper understanding of theoretical basics and the learning of the Guide's tasks. However, for basic self-use, the depths which are needed, will be easy to understand and easy to manage for anyone. But in this article, just to demonstrate some attractive and beauty items of the essence of theoretical background to savvy readers, some basic concepts are discussed more deeply than we are doing it during the training of the methodology.

The goal and some significant advantages of *Systemcoaching Methodology*

The main goal is to help in making order. The methodology should organize, help, or even be the base of any other method or solution. For human systems, a further, very important goal is to help preventing trouble, crisis burnout, peptic ulcer and to find pleasure, results and success in the operating environment of the given system. (*Ziegler 2011, 2012*)
The *Systemcoaching Methodology* confronts the systems, with all environmental gross-systems simultaneously and completely.
Some of the advantages of the methodology:

- We can depict the overlapping and multifactorial sum of our real, complex, working systems in a horizontal map. The map is truly complete, no neglected large systems will cause divergent problems.
- *Systemcoaching* does not imply any value judgement. It does not say whether a situation is good or bad. It shows the factual distance of the given situation from the target set in each gross-system. The methodology, depending on the degree of distance, will suggest proposals in the first step: what kind of change, exchange, modification or even crisis management is needed, project or program, reorganization or control process. In this sense, we are "coaching" our system – gross-system relations.
- The methodology needs disciplined thinking and implementation. And it helps to think and implement that way.
- The *Systemcoaching* is not excluding or replacing other methods. On the contrary, it can serve and integrate all kinds of other, already known and used correct methods.
- Easy to learn on basic level. The first results are already available usually after four times half day training. The full training of the whole methodology is much longer, but it can be learnt step by step.

The S*ystemcoaching* methodology is more than just simple modeling of human resources – environment gross-systems. It is applicable with certain extensions for all kind of situations, where real, complex systems are parts of gross-systems. (*Ziegler 2017a*)

2. SYSTEM BASICS

Systems science – real and imaginary systems – the effect and to affect

The real world, from the smallest functional elements to the Universe as a whole – including us – is composed of real, complex, working systems. Another very important group of systems are the imaginary (inoperative!) systems. Real effects can only be made on real systems. Only a real effect can have an *effect on = affect* the other real system: to cause a change of state of the real system. The usual, less exact common name of this process is interaction. The imaginary systems cannot be impacted by means of real effects.

> *I will use the terms as follows: Effect (noun) – the physical quantity, measured in Js. Affect (verb) – to have an effect on, to influence, to impact a real system. Effect-exercise (noun) – if we want to speak exactly about the process, to make the difference between the quantity and the process.*

The two groups are together the subject of systems science.

Systems science is the sum of the knowledge, laws and rules of the theory and practice of real and imaginary systems, independently of which other science the given rule or law originates from.

If we know these rules, we can professionally model and work with them. If we do not know them, the gross-systems of the real world will operate independently of us, we will not understand this operation properly, so we cannot steer – we are just drifting with the tide.
The native language of the rules mentioned above is the complex mathematics. This makes the access to the necessary system knowledge difficult. In the *Systemcoaching,* the proposed solution to this problem will be the precise usage of the words of human language, instead of the language of mathematics – Confucius: „…It all depends on the correct use of names…" (*Hamvas 1948*)

The main branches of system science

System science, of course, is based on the achievements of many disciplines including quantum physics, mathematics, biology, other natural sciences, social sciences and cosmology. Yet, if we want to classify the systems science itself, we can divide it into three main branches:

1. *Physics:* A set of disciplines dealing with the basic operations of the real systems. The knowledge of the five types of basic exercise of effects, from the quantum physics model to the theory of relativity.
2. *Information Science:* A set of disciplines dealing with the basics of imaginary systems. The knowledge of the essence of imaginary information and state modeling and of the key role of entropy.

3. *Control science:* A set of disciplines connecting the real and imaginary systems, including historical process control and automation, cybernetics, leadership science, management science, robotics, RPA (Robotic Process Automation), the development of artificial, and even, perhaps once in a not too distant future, also the development of natural intelligence.

Hereinafter, I present the major concepts of these three areas, which are essential for the understanding of *SGS* model and *SnF* method of the *Systemcoaching Methodology*.

The concept of system

The term *system* is defined by almost every discipline in a unique way, but in this case they are not satisfactory. Without going into the details of the theoretical background, which would go beyond the limits of this article, we can divide the attempts for correct definition into two large groups. The practical, traditional trends tend to define the system very logically, from its contents. One of these definitions, based on the statement of Dr Imre Kiss *(Kiss 2005),* can endure every test: *The system is a set of related elements.* Any additions or explanations, restricting the elements or relationships, i.e. binding to expediency, or to anthropic attributes – would reduce the entire system concept and therefore would exclude some system groups from the definition. The above definition is correct. However, it is rather universal, and not suitable to be the basis of practical applications. An extended definition, valid for both real and imaginary systems and reflecting the symmetries of physics, would do in the future. We need more considerations for this. Even so, we cannot say that, according to our present knowledge, we would have a final and ”cast in stone” definition. Due to the developments in physics, needs for adjustments may arise in this area. For example, it is possible that today's smallest, physically indivisible real system elements – still mostly handled as an imaginary concept – will be replaced by eleven-dimensional spacetime cells, which are 10 orders of magnitude smaller, than the smallest element known today. If it happens, it will open new dimensions in the interpretation of effect-exercise and in the definition of system concept.

Considerations based on our physical knowledge today:

1. The gross-system Universe (U) is one, integrated whole, vibrating and waving real entity.
2. All elements and relations of the U gross-system obtain in every vibration a new, integrated overall configuration.
3. The name of the imaginary concept of these real configurations is status. (If the status is the configuration of smallest real elements (fermions) and smallest real relations (bosons) in the shortest possible period (Planck duration), then this is an actual microstate.)
4. This real system of U, due to its state changes, allows imaginary systems to be described by means of imaginary state variables within the imaginary state spaces.

(Systems science does not imply value judgement and does assign different priorities to real and imaginary systems. It contains the system knowledge regarding the both.)

5. We can consider this gross-system U, where we live, from inside, from our *imaginative* modeling approach, like the bulk of *real*-connected *real* elements.
6. But we can also assess the U by concentrating on the imaginary amount of information. The imaginary amount of information, or shortly information, which exists because of the real difference of configurations, which causes imaginary difference in the states described with imaginary state-variables.

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Any arbitrary part of the U real gross-system is system (S),
if S is separated from the U ' = U - S Universe residue at least in one real direction, or at least in one real physical characteristic.
Any arbitrary part of the whole U of the possible imaginary entities is a system (S), if S is separated from the U'=U -S residual imaginary entity of at least in one imaginary relation or at least one imaginary variable.

This definition is equivalent to the previous one. However, it does not focus on the internal structure of the real systems, but on the fact of environmental separation. This separation means also the symmetrical fact that any system has at least one out-of-system connection to the environment, to the whole large system. Separation is realized in the real systems by the real elements, the fermions, and by the real connections, the bosons, while in the imaginary systems by the imaginary elements, the concepts and by the imaginary connections, the relations.
The two different definitions show the same, only the lenses are different through which we look at the system. For the SGS model, this second, distinctive approach will help to understand and applicate better.

Although it is irrelevant on this level of our methodology from the point of view, but for the sake of completeness I would refer to an open question on the above definition: This definition is not exact either. The exact boundaries of universal U and U systems are missing. With a deeper analysis of this definition, we must conclude, as a system-scientist, that the Universe gross-system itself should be part of an even larger, still unknown multiverse entity. And indeed: The various kinds of multiverse theories are no longer considered by physics as they were all of the devil. There are some mathematical models (e.g. the brane-theories) that are surprisingly matching to measurable facts about the genesis of the Universe. The problem is with these models, that they need a multi-dimensional (11 independent spacetime dimension) and multiverse environment. The U and U systems are the frame-concepts of our present knowledge, but the deeper understanding of the frameworks of our actual systems is still in the more distant future.

To further use the SGS model and the SnF method, it should also be noted that in practical applications, we are rarely working with the actual elements of the real systems, with the fermions. In general, we consider a much larger part system for a model element, which is modeled as a black box that cannot be divided further on the given level of the task. This has far-reaching consequences in the modeling of the states of systems. And their inaccurate usage, confusion of micro- and macrostates, might lead to rapidly increasing errors.

The elements and the connections of a real system

The actual elementary creative entities of real systems, which can no longer be separated into additional components during the real effect-exercising process are the fermions and bosons. The fermions are the real building blocks, the real elements. The bosons are the real connections.

> *However, we cannot say they are very small. Each fermion and every boson represent at least a fundamental effective amount of action (Planck "impact" or "effect" quantum, = h) – which vibrates and fluctuates, and can be described with an imaginary wave function extending over the full real space time. We can also say that – in certain respect – every particle is as large as the Universe itself. However, the effect of fermions and bosons can only be manifested in a relatively small size of the four-dimensional spacetime. It means, that the four-dimensional findability - floor area of the imaginary mathematical "hump" (=the magnitude of the wave, written by the Schrödinger-equivalency), is relatively small. That is explaining, why the fermions and bosons seem small to us.*

> *Note – Some information to the order of magnitude of term "relatively small": The estimated size of visible universe is 10^{27} meters, the average atoms are 10^{-15}meters, the smallest element, the neutrino is 10^{-24} meters. The space dimensions of the smallest possible space cell are only around 10^{-35} meters! In other words: the size of the space cube of the findability of the smallest particle neutrino is hundred billion times hundred billion times hundred billion – equal. $10^{11*11*11}$ – space cells.*

The form of vibration of the fermions with three long spatial dimensions and with time is such that the amounts of the effects of two similar fermion cannot "accumulate". They cannot manifest at the same time in the same space. The imaginary "hump" of their waveforms describing their total spatial vibrations evade each other. They are therefore suitable for securing separation. The shape of the bosons, however, is such, that any number of similar bosons can manifest at the same time in the same "point" (= minimal Planck dimension spacetime cell) in the spacetime. They are therefore suitable for establishing connections between the fermions.

> *We can find more detailed information of the spacetime models in the physical literature. But for those interested there are also very good educational works and popular science books from the prominent physicists – and although there is no need for such a depth of knowledge about the Systemcoaching Methodology –, it is worthwhile to rotate them as well. (Carroll 2010; Feynman 2005; Geszti 2014; Greene 2003, 2011; Kaku 2006, 2010; Taylor - Wheeler 2006; Weeks 2009)*

The world of quantum physics particles is extremely complicated but relatively easy to formulate from our system modeling perspective.

1. There are three kinds of basic fermions, that is, three types of *system elements*: electron, quark, neutrino. Of course, they have more species, families and antiparticles, so the number of fermion types is far more than three.
2. There are five types of basic bosons. Four "gauge" bosons, namely *system relationships:* graviton of the gravity, photon of the electro-magnetic interaction, weak gauge bosons of the weak interaction, gluons of the strong interaction. And the scalar Higgs boson, which is responsible for the mass of particles. Among these particles, the weak and the gluonic bosons themselves may also be several, but we do not go into such depth.

Let us model any real system on any level, there are always the same elements and connections in it. Let us talk about any level of communication, interaction, effect-exercise, change of state of system, we cannot model them with arbitrarily chosen properties. Especially not with anthropic attributes. Only those models will be scientifically substantiated and, above all, viable in practice, which will not contradict physical knowledge at any level. The model of *Systemcoaching* is not an exception to this.

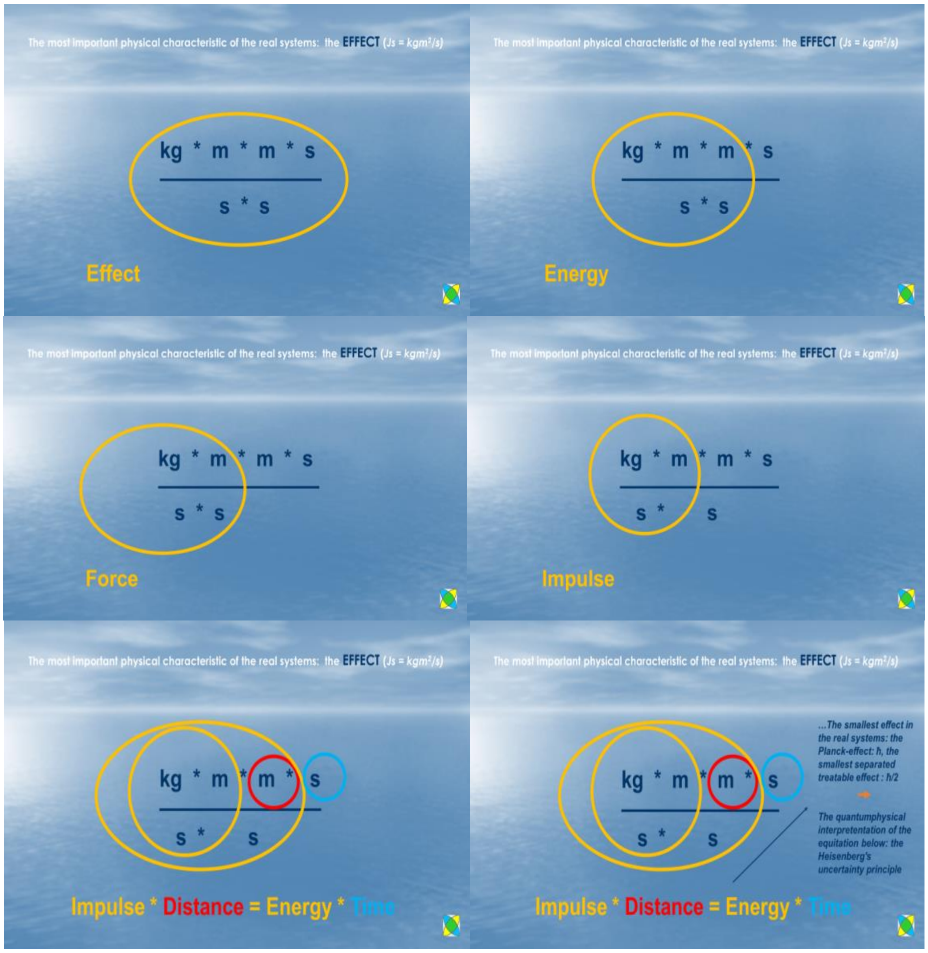
The concept of effect (quantity)

The actual quantity of the effect is a physical characteristic or physical quantity, having unit of measure Joule-second (Js). The effect is vibrating, fluctuating and waving in its real manifestation. This vibration, according to the laws of our universe, has a minimum vibration duration. No shorter duration of effect-exercise is allowed in this universe. It also has a minimum wavelength. Shorter wavelength resonance is also not possible. We can model the spacetime available to us, the three long space dimensions plus the time dimension, like three-way sequences of these small cells, vibrating once in every Planck duration. The space cells are many orders of magnitude smaller than the real affecting elements. From the point of view of our modeling, these space cells also have a significance: the micro- and macrostates, and through these, the amount of the decreasable mathematical uncertainty (amount of information) are depending on the behaviour of the space cells.

> *For the sake of completeness: there is a scientific theoretical, or even philosophic debate, whether the spacetime cells are to be handled as real entities of the real Universe, or these are only imaginary concepts to help the modeling. Systems science has no position on this topic. We use it for modeling anyway.*

The macro level effects are, of course, a sum of the effects of very large number of vibrating elemental particles. But this does not change anything by the fact that the amount of effect is the basic physical characteristic from which the other characteristics can be derived by highlighting certain space, time, and mass features. A very simple example is shown in the first figure. *(Figure 1)*

Figure 1: Demonstration of some basic relationship of the effect during the general presentation of the Systemcoaching Methodology, with the help of the units of measurement



Source: Part of the Systemcoaching presentation of Éva Ziegler– „The effect of the globalization and of the changes to the functions of management of the human resources" Scientific Conference and Professional Forum in Debrecen, September 29, 2017

Understanding the nature of the micro and macro effect will be important for understanding the parts of the practical methodology regarding the exercise of effect and for setting up the SGS model.

The concept of the information – uncertainty, microstate, macrostate

In human systems the concept of information is fundamental. Still, in this case, if possible, the grey zone of the definition is even bigger than it is in the case of the

system concept. This is proved by the fact that it is often said in our projects, programs, and life that an information is "given or received".
However, if we understand the exact definition of information, we do not say that anymore. And this is not only a casuistry. But we must model it quite differently if we know that imaginary *information will never be given or got between the parts or elements of a real system.* Only the actual quantity of the real effect will be moved. We do not share any imaginary information, which is "stored" in us. But we have a real effect on the other real system, through real communication, by which we change the real system states there – and only the amount of imaginary uncertainty will be decreased on the receiving side, by the difference of the real system states. The difference of the uncertainty will be the amount of the information that is generated at the receiving side. (*Ziegler 2013b, 2015*)
Again: the information itself will never be given or got between real systems. The information is created in every case again and again. The information is an imaginary entity. We can define it with mathematical or human languages. Let us start with the latter:

The amount of imaginary information generated in the real system
due to the change of the state of the system, caused by real exercise of effect, is equal to the difference
of the imaginary uncertainties between the two system-state.

The lack of this knowledge, as I experienced, quickly leads to serious and possibly irreparable mistakes in the management, leadership, projects and programs.
"The imaginary mathematical uncertainty of a real system is depending on, how many macrostates are distinguishable on the same number of microstates in a certain moment, looking forward into the future. If many, then many possibilities of the macrostates can manifest in a certain moment in the future. In that case the system has big uncertainty, which macrostate will really happen. As the new macrostate is manifested after the change of state, the uncertainty decreases to zero. The system realizes big amount of information. If only a few macrostates are distinguishable, then it is characterized by few possibilities, small uncertainty, and low amount of information.

The link between real and imaginary systems, the single „gateway" between them is the creation of the information = decreasing imaginary uncertainty due to real change of state.
The simplest mathematical form of the information – with reference to Hincsin, Shannon and Kiss. *(Kiss 2005)*

$$[1]\ \mathbf{H(A_i) = \log Y = \log 1/\, p_i = -\log p_i}$$

Where H is the decreased amount of the uncertainty of the i-th A physical event (= i-th A change of state), Y is the sum number of all A events with similar probability, p_i is the probability of the single A_i events." (*Ziegler 2018*)
The newly created information is strictly depending on the states of the given system. However, it is a more complicated question how many distinguishable

macrostates will be known in the system. All real systems are changing from one microstate to the next one in each Planck moment. All microstates are different. If anybody could distinguish all microstates, he would receive the maximum amount of the information possible in that system. But he is not able to use it, even cannot memorise it. (He should be a kind of special imaginary entity, named in the physics „demons", like „Laplace's demon, or Maxwell's demon – somebody, who does or observes something in a model, which is not allowed to do or observe in the real world according to the laws of physics. Our Great Observer Demon, having the maximum information, is a similar imaginary entity…)
The distinguishable macrostates – depending on the level of the examination in the system – include always a very big number of microstates. The system can step into a new macrostate in two ways.

- On the one hand: apparently without any external intervention, without any external exercising of any macro effect.
- This is relating to the virtual particles of the quantum physics. In this topic we do not discuss it in detail.
- On the other hand: Due to an external exercising of a macro effect.
- New amount of information is created here in both cases. But in the second case the system was in real contact with another system: he gave or received effect, the macrostates of both systems are changed. And: the distinguishable macrostates are not depending only on the system anymore, but also on the new, linked, common *gross-system*.

This is a fundamental fact in the systems science. And, usually it is not taken into consideration in other kinds of models and methods in other subject areas such as economy, management and projects. Consequently, we model the systems, the information-systems and especially the levels of the hierarchic control systems erroneously. Which brings clearly erroneous results as well.
The base model of the *Systemcoaching Methodology* is the SGS model. The intention is to highlight in the name of the model the above detailed very important statements: we work with „Systems in Gross-Systems", that is with the SGS model.

The concept of control

The concept of controlling in physics and in cybernetics is unavoidable and unambiguous. The word is often included in social sciences, especially in economics and management science, but it is not always used according to the clear and precise definition of the term indicated above. Moreover, on macro-level, the management science itself is using the concept of organizing like the symmetrical pair of controlling. From the systems science point of view the latter can only be supported if the organizing and the controlling are used on the macrolevels of practice consistently and precisely, with all its consequences.

> *But in the meantime, we need to remember the real systems do not actually distinguish the two in the real microstate changes. Since both concepts are one and the same on the level of the physical elements and relations, that is on the level of the real microstate changes.*

Back to the two concepts, the organizing and the controlling on macrolevels can be approached from several directions. Let us look at the most important ones.

1. *Controlling* is a special series of the effect-exercising steps of an **I** real controller system. It is a special process: sampling (real or imaginary), comparison with an imaginary setpoint or with a real basic characteristic, decision, intervention – always in another real **V**, controlled system's operational process.
2. *Controlling* is a special series of the effect-exercising steps, during which the **I** controller system intervenes in the operation of the **V** controlled system in such way, that *a series of macrostates (that is a process)* in **V** will be started, persisted, changed or stopped.
3. *Organizing* is a special series of the effect-exercising steps, during which the **I** controller system intervenes in the operation of the **V** controlled system in such way, that *a structure* in **V** will be built up, persisted, changed or eliminated.
4. *Controlling* influences *the real process* (the series of real state changes) of the **V** real system. It is based on an imaginary objective or setpoint in **I** system, or on a real basic characteristic in **I** system, changing the real state of the **I**. Due to this real state change in I, a series of changed real states (process) will happen in **V** as well, based on the rules of the physics.
5. *Organizing* influences *the structure* (*one* real state in a certain moment) of the **V** real system. It is based on an imaginary objective or setpoint in **I** system, or on a real basic characteristic in **I** system, changing the real state of the **I**. Due to this real state change in **I**, a series of changed real states (process) will happen in **V** as well, based on the rules of the physics, but with a specified, special state at the end.

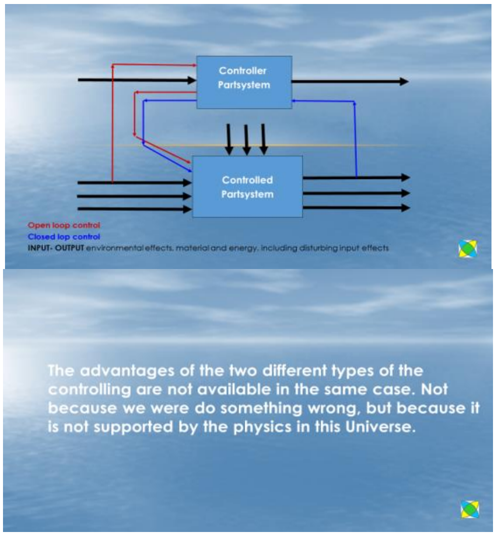
All our projects and programs are working accordingly, no matter if we are aware of that or not. And even if we try to prescribe and define it differently with our anthropic freedom.

The two main types of control – exact output *or* disturbing input filtering

There are two different types of controlling: *closed loop controlling* and *open loop controlling*. They differ in the source of the sample used in the controller **I** system: If it is the INPUT side of the controlled **V** system, then it is open loop, if it is the OUTPUT side of the **V**, it is closed loop. In case of open loop control the sample gives effects and/or information from the INPUT side, that is from the states of the environment. In case of closed loop controlling the sample gives effects and/or information from the OUTPUT side, that is from the states of the **V** system. *(Figure 2)* Now we can see already, why modeling is so important. If the **I** system is influencing the **V** system based on a sample of the environment, then any exact output of the project or program in **V** can be realized – till the extent of quantum uncertainty – but we cannot filter and/or compensate any other disturbing INPUT effects after the intervention of the **V** system. If the **I** system is influencing the **V** system based on a sample of the **V** system, then no exact output of the project or program in **V** can be realized, but we can filter and/or compensate any other disturbing INPUT effects after the intervention of the **V** system.

We do not find too many publications or dissemination materials of the above due to the difficulties of their complex mathematical tools. But if interested you can find some useful literature at the end of this article. (Csáki and Bars 1972; Fodor, 1998; Keviczky et al., 2009; Korondi, 2013; Kumar, 2013; Szilágyi et al., 2008)

Figure 2: Schematic representation and of the open loop control and the closed loop control



Source: Éva Ziegler – „The Ziegler-Systemcoaching – Introduction to the basis of a new methodology" – Scientific lecture on the joint event of the Human Resources Development Department of the Hungarian Military Science Society and of the National Association of Human Professionals, May 11, 2017

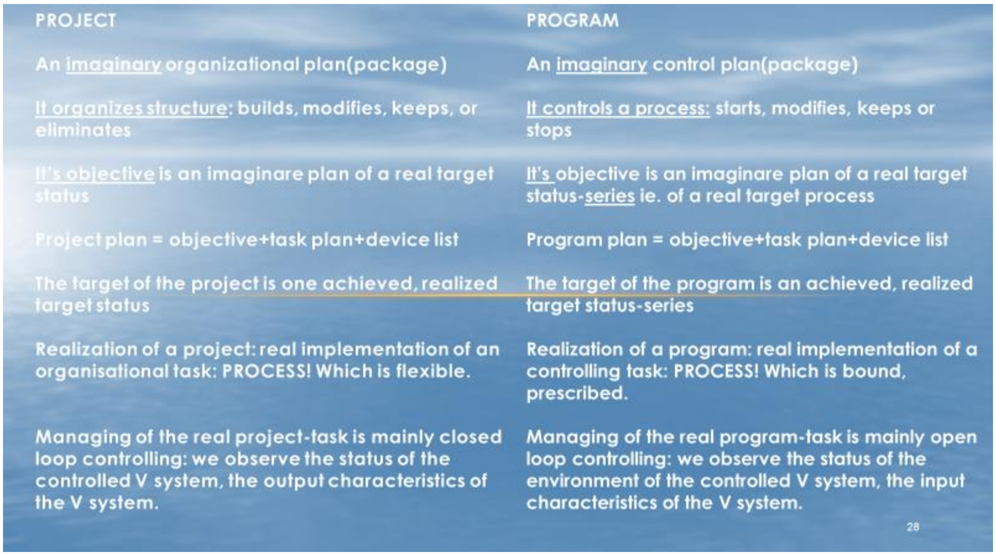
The above knowledge is basically used in the controlling of the cybernetic, technic systems. But both the rich professional literature and models of the controlling of the economic and social systems rarely refer to these, and even less frequently apply them. However, the real systems do not care about us, they work in a fully independent way.

We can also see, that control – as opposed to public beliefs – does not only exist as an imaginary model. It is not merely present in human, computing, conscious planning. Most of the nature's most perfect controlling processes lack any imaginary model, plan or setpoint. The interaction of two real systems, that are the physical processes are often creating controlling processes. The exact distinction between imaginary variables and the real physical characteristics, the precise distinction between the signs, the news, the data, the information concepts is very important, but they are still often confused in the modeling of the systems, projects and programs. (Fodor, 1998)

If we want to build usable models and correct methods in human communication and control, we must be familiar with the above emphasized background of systems science, since all projects, programs, states and processes of our daily life are based on these facts, no matter if we know it or not.

Project and program

Figure 3: Brief summary of differences and similarities of the project and the program



Source: Éva Ziegler: „ The lack of knowledge of system-science in the daily practice – or, why are the projects getting to be ruined?" – Budapest Science Meetup presentation, MTA, February 09, 2017

A brief summary of the phrases „project" and „program" – based on the details in the article *Ziegler, 2017b* – is on the *Figure 3.* Project is used when we want to achieve a certain target state. Program is used when we want to achieve a certain target state-series. *(Table 1)*

Table 1: Project or program in the controlling and in the organizing

	Start/Build up	**Persist**	**Change**	**Stop/Eliminate**
Controlling	Project	Program	Program	Project
Organizing	Project	Program	Project	Project

Hierarchic levels of control

The *Systemcoaching Methodology* needs precise work with the levels of the controls in the Gross-Systems. These levels are connected to the levels of the system-hierarchy, but they are not the same. The conventional levels of the control in a system are: *operative, tactical, strategic* and *(system) political* levels. The expressions come from diverse historical and military areas, they have the same roots, but they have nothing to do with the daily meanings in the media today, e.g. in connection with political parties.

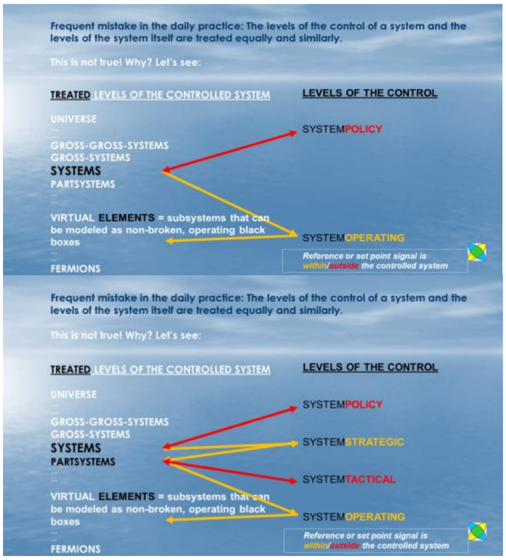
- *Operative level:* It is an internal, „coordinative nature" controlling of the operational work of the elements in the part systems of the S system, between the elements in the part systems. It is based on the common „goal" of the elements: on the real target status or on the imaginary objective.
- *Tactical level:* It is an external, „competition nature" controlling of the part systems in the S system, between the part systems. It is based on the own „goals" of the part systems: real targets or imaginary objectives.
- *Strategic level:* It is an internal, „coordinative nature" controlling of the part systems in the S system, between the part systems. It is based on the common „goal" of the part systems: real target status or imaginary objective.
- *System political level:* It is an external, „competition nature" controlling of the S systems in a gross-system, in the environment, between S and the other systems of the gross-system. It is based on the own „goals" of the systems: real targets or imaginary objectives.

The process of controlling, the series of exercising the real effects are similar at all levels. The main difference is between the location of the setpoints or base characteristics of the controlling. This location is outside the controlled (part)system on the levels of „competition nature" controls – it means, the setpoint is „not known" in the controlled (part)system. And it is inside the controlled (part)system on the levels of „coordinative nature" controls – it means, the setpoint is „known" in the controlled (part)system. *(Figure 4)* The word „known" is here only for help, it is an anthropic expression.
It has now also become clear, that the number of the levels of the control and of the system are not equal. However, it is a usual mistake not to distinguish between them.

- A non-subdivided system has two system-levels: elements and the entire system. It has two control-levels as well: operative and political.
- If the system is subdivided into part systems, the number of the system-levels increases with one new level up to three, but the number of the control-levels increases with two up to four.
- Every further subdivision of the part systems results in one additional system-level, and two additional control-levels.

As every correct model, the base model of the *Systemcoaching,* the *SGS* model must handle the above clearly and exactly.
We have overviewed some important thoughts of the systems science. Without any further methodology, these knowledge is already a significant help in the daily work, in the understanding of the basic operations of the systems. We can build and use any kind of correct models or methods on the basis of this. The SnF method is one, maybe the easiest, quickest and at the same time it is the most usable.

Figure 4: The relationship between the four traditional levels of hierarchical control and the system levels



Source: Éva Ziegler: Complex Systems - Széchenyi István University, Economics Informatics MSc. course

3. THE *SnF* METHOD

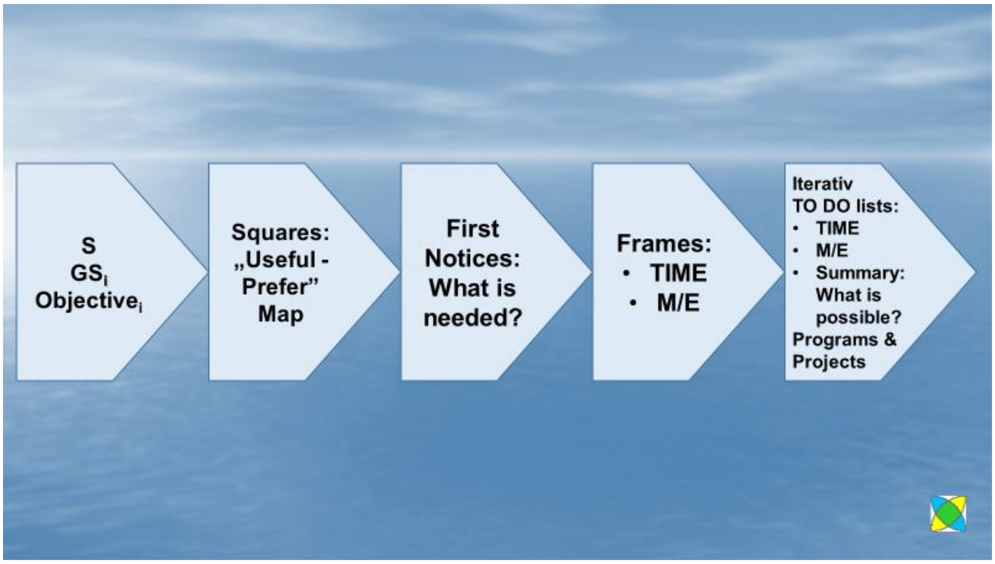
The 3 phases of the *SnF* method

1. The 5 basic steps
2. The detailed plan: The Goal Plan
3. The process of realization

1. Phase: The 5 basic steps *(Figure 5)*

I promised to use a pencil and some square grid papers… let us see, how we work with the *SnF* in the practice.

Figure 5: The 5 basic steps of the first phase of the Systemcoaching Methodology



Source of the figures 5 - 13: Éva Ziegler: "The World of the Order I. - Systemcoaching - The Basics of the SGS Model and the SnF Method" – Manuscript of the book under preparation

In the first step we define the S System and the GS_i Gross-Systems. See the 1st column in *Figure 6*. In the same step we link the imaginary *tactical objectives* of the S System in each GS_i Gross-Systems (O_{iS}), and the *strategic objectives* of the Gross-Systems (O_{GSi}) to the Gross-Systems. (2nd column in *Figure 6*) The numbers of the Gross-Systems are free to choose. The theoretical minimum is one, the Universe itself. The practical interpretable numbers are between 1 and y, where y is depending on the demand of the accuracy of the planned objectives and on the intended work of the S system. If, a new demand is occurring during the iterations in the methodology, it will be added without any problem. The sizes of the Gross-Systems are irrelevant as well. The main point is, that one of the Gross-Systems must be the „Rest of Whole Universe".

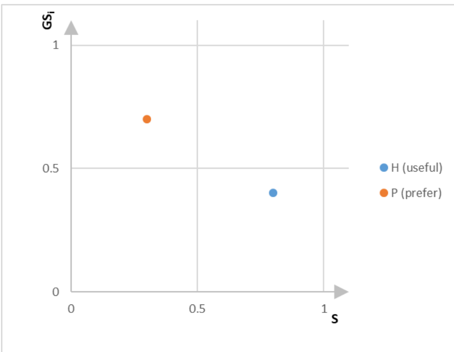
In the second step we prepare our square-maps for the S-GS_i relations *(Figure 7).* We assign 2 points to the S in each GS_i. One point shows, how useful are the S and the GS_i for each other. The other point shows, how they prefer each other. The main values on the scales, 0, ½ and 1 are only signs: 0 represents the biggest damage, 1 represents the best result, the highest level of the compliance in the given GS_i. These are always compared to the given objectives O_{GSi} and O_{iS}in the given GS_i Gross-System. The value ½ represents the neutral relations: not good, not bad – indifferent.

Figure 6: The first basic step: List of the Gross-Systems and of the objectives in the Gross-Systems / objectives in the System

Gross-system	Objective	MAP	First Notice	Time Investment	Time TO DO	M/E: Money income/outgo	Money TO DO	Outcome TO DO	Expected Target
GS_1	O_{GS1} / O_{1S}								
GS_2	O_{GS2} / O_{2S}								
GS_3	O_{GS3} / O_{3S}								
...									

The scales and the small maps should never be combined or compared to other GS_j Gross-Systems! The detailed explanation of exact meanings of „useful” and „prefer”, and the exact definition and preparation of the scales would exceed the limits of present article. They are thoroughly detailed in a longer forthcoming book of the *Systemcoaching Methodology*. *(Ziegler, 2018)*

Figure 7: Map for the System-Gross-System relations



We have now all the small square maps, see *Figure 8*.

Figure 8: The second basic step: Maps

The third step: we prepare our *First Notices* based on the situations shown on the maps. *(Figure 9)* The First Notices are short verbal forms to the GS_i-s. Is there anything to do? „Most probably” a *program,* or a *projec*t? To *start*, to *sustain*, to *stop* or to *change*? Why? – Was there a recent *change* in the environment, or is it an internal system-need for a *modification* or for a total *exchange* – or are we facing a must-to-handle *crisis*?

In the fourth step we calculate and fix the first *frames*: Time (T) and Material/Energy (M/E). The unit of the time should be the easiest manageable unit: hour or day but depending on the S System it could be nanosecond or even a century as well. The unit of the M/E can be any unit of energy or material. But in our special human-system circumstances we use now a „general equivalent unit”: money. EUR, USD, HUF, anything the S prefers. The used time in all Gross-Systems together cannot overstep 24 hours in a day, 52 weeks in a year, and so on. The amount of used money can never run below zero. (It looks like a cash flow calculation, but it is *significantly different* here*!* We are speaking about real material/energy processes – about staying alive…) *(Figure 10)*

Figure 9: The third basic step: Notices

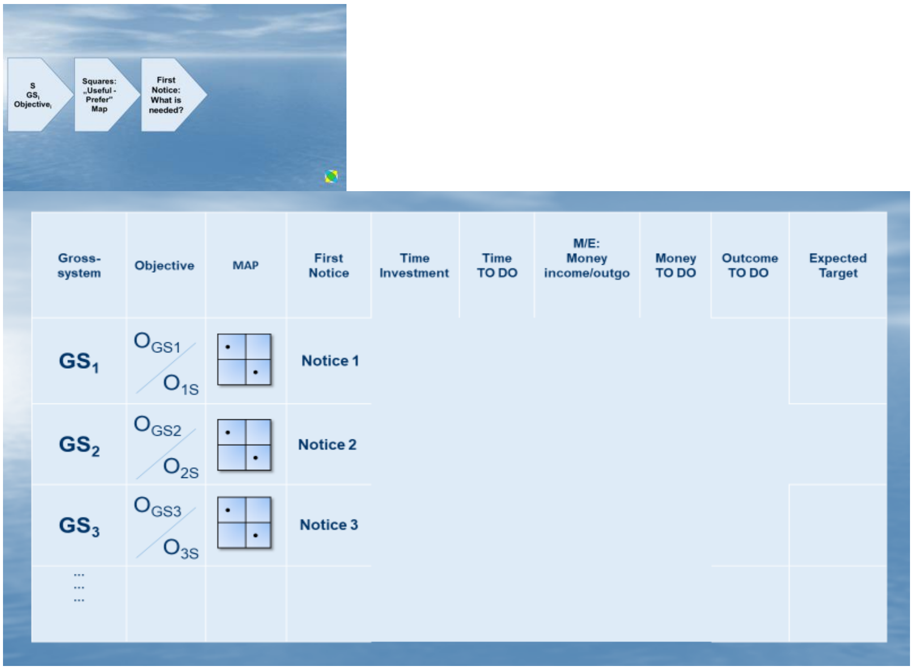
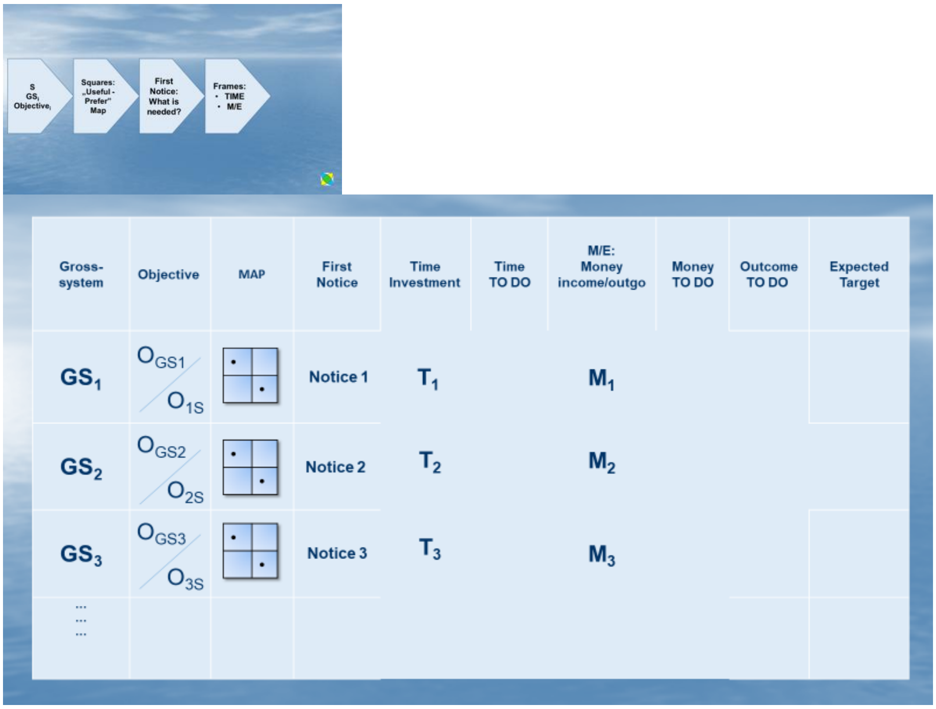


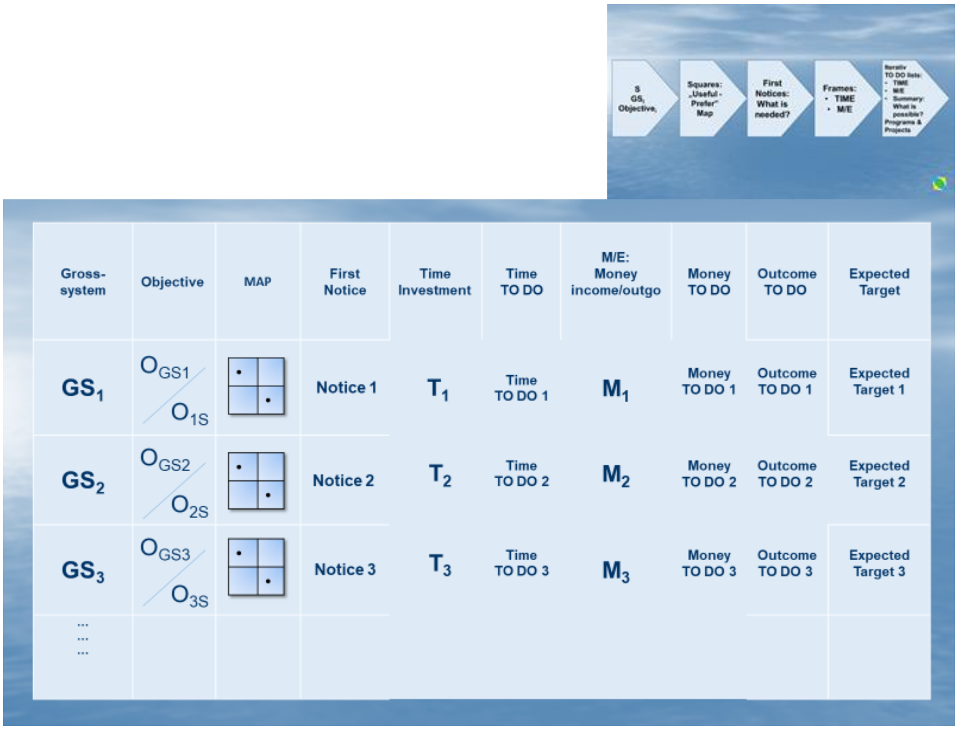
Figure 10: The fourth basic step: Time and money frames



Now here is the fifth step:
a) We confront the wishes in the First Notices and the Frames of Time and Money. We prepare two lists: „Time TO DO" and Money TO DO", using an iterative process. *(Figure 11)*
b) We confront the two lists, to prepare a final „Outcome TO DO" list, using iterative process again. The result, the outcome TO DO items should be compiled to a new, „Expected Target" status of the S in the GS_i. *(Figure 12)*
c) The expected target must be visualized on the map as well. *(Figure 13)*

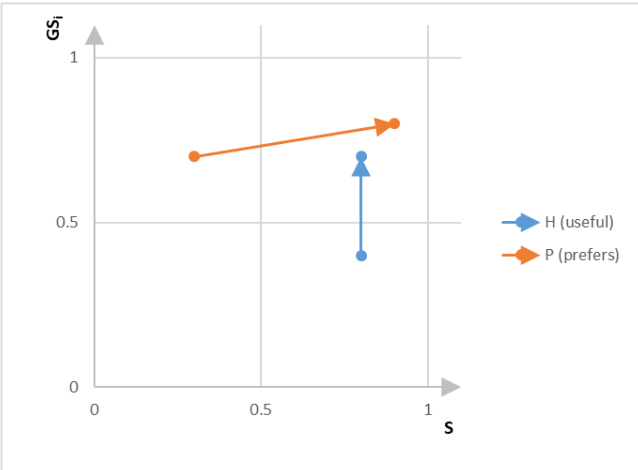
Figure 11: The fifth basic step: a) TO DO lists of Time and Money

Figure 12: The 5th basic step: b) Outcome TO DO list with the Expected Target status



Gross-system	Objective	MAP	First Notice	Time Investment	Time TO DO	M/E: Money income/outgo	Money TO DO	Outcome TO DO	Expected Target
GS_1	O_{GS1} / O_{1S}		Notice 1	T_1	Time TO DO 1	M_1	Money TO DO 1	Outcome TO DO 1	Expected Target 1
GS_2	O_{GS2} / O_{2S}		Notice 2	T_2	Time TO DO 2	M_2	Money TO DO 2	Outcome TO DO 2	Expected Target 2
GS_3	O_{GS3} / O_{3S}		Notice 3	T_3	Time TO DO 3	M_3	Money TO DO 3	Outcome TO DO 3	Expected Target 3
… … …									

Figure 13: The fifth basic step: c) The new map of the i-th Gross-System referring to the expected new status



2. Phase: The Goal Plan
After the first phase of the SnF method, that is, after the five basic steps, our second phase is the preparation of the detailed plan, the Goal Plan. The model or method to use is free to choose: it can be the SnF further, but any other preferred or known, system-scientifically correct method is applicable into the second phase. The *Systemcoaching Methodology* is integrating such kind of methods, works together with them and helps them. Also, the meticulousness of the specification of the Goal Plan is fully on demand of the user. It can be a fully specified, very detailed complex network plan or schedule, but also a simplest draft. The specification can be changed in any step of the *Systemcoaching*, depending on the demands of the user and of the given task. The *Systemcoaching* itself also allows to omit the preparation of Goal Plan at all, and to use the „Outcome TO DO" list only. The principle is similar, as it is in the whole methodology: *Systemcoaching* should make the life of the user easier and less complicated.

3. Phase: The process of realization
In the meantime, many processes are running in our mapped gross-systems. The implemented target states are partly like the planned objectives, partly not. By tracking the implemented target states, we will see whether our original plan has really taken us to the planned new map, or not. We can also decide, how to qualify a potential given deviation. If we stick to the original objectives consistently, we will prepare the "Second Notices" for the inclusion of new projects and/or programs and create the new "TO DO" lists as well as the modified detailed plans. However, a new kind of implementation, a new target state can be even better than the planned one. In that case we can modify also our objectives. *Systemcoaching* does not categorise the user as good, or bad. It is also not prescribed to what extent the objective should be adapted. Adjustment of objectives is not a failure, but a possibility. Of course, it is always possible to improve during the method's process, if we are looking to our plan and map. If it is happening every day, then we can correct even on daily basis. If we inspect our map only once in a month, or in a year – then also the adjustment can be made in that periods. There are no prescribed periods of the inspection of the implementation. It can be made on demand of the user. Even different durations are also acceptable. *Systemcoaching* is very flexible in this aspect.

The above-mentioned large flexibility of *Systemcoaching* is due to the fact, that the methodology is rooted deeply in the operating rules of the real systems.

4. SUMMARY AND FOLLOW-UP

The road that led to the *Ziegler-Systemcoaching Methodology* begun 35 years ago.
The first step was an eye-catching experience in my work at big international companies. The strict knowledge of systems science, which I acquired at the universities as system-engineer, is very useful and efficient in all other areas of the economy and in the world of finance – if those are exactly and consequently used. Later, as a researcher and an advisor, I used my models and methods not only for my own job, but also in the work made for my partners. Now I am at the beginning of the next phase: the *Ziegler-Systemcoaching Methodology* is developed enough to stand on its own legs to help wider range of scientist, managers and customers. But a methodology is never ready or finalized. Every news in the world of the physics,

every practical experience, every user, and every constructive opinion is helping me to develop it further, to develop the scientific background and to fill up the case-pool, to improve the methodology. The follow-up will be even more important: to teach, to train the System Guides.

5. ACKNOWLEDGEMENT

I am grateful to all friends, customers and colleagues for the many discussions and innovative ideas in these years and hopefully also in the future.
Thanks to my friend, József Poór, professor of the Szent István University, for the encouragement in my research work and for the name of the *Ziegler-Systemcoaching Methodology.*
Thanks to the many colleagues in the universities in Pécs, Debrecen, Kaposvár, Kecskemét, Budapest for the diverse possibilities to keep introduction- and training-lectures on the new *Systemcoaching Methodology*.
Special thanks to the professors László Gulyás and Gabriella Keczer at the University of Szeged, for the kind invitations and warm welcome to the *„…After Taylor…"* conferences, where I could present year by year my research and results in the science and in the development of the *Systemcoaching.*
Great thanks to my friend and colleague János Lukács, professor of the Corvinus University of Budapest for the opportunity to work as a guest lecturer also on the economic side of my research work, in the communication courses in the past years.
Very special and great thanks to the rector of the Széchenyi István University, to professor Péter Földesi and professors János Kovács and Miklós F. Hatwágner for the opportunity to participate in the work of the university, keeping lectures in diverse courses of complex systems and systems science.

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A REND VILÁGA - A ZIEGLER-RENDSZERCOACHING RENDSZERTUDOMÁNYOS HÁTTERÉNEK ÉS GYAKORLATI ALKALMAZÁSÁNAK ALAPJAI

Ziegler Éva

A Ziegler-Rendszercoaching módszertan története 35 évvel ezelőtt kezdődött. A fejlesztés folyamatában az első lépés a nagy nemzetközi vállalatoknál végzett munkám során szerzett tapasztalat volt. A szigorú rendszertudományos ismeretek, amelyeket az egyetemeken rendszerfejlesztő mérnökként szereztem, kiemelten hasznosak és hatékonyak a gazdaság és a pénzügyi világ minden más területén is – ha pontosan és következetesen alkalmazzuk ezeket. Később kutatóként és tanácsadóként nemcsak saját feladatkörömhöz, hanem partnereim számára készített munkáimhoz is használtam modelljeimet és módszereimet.
A Rendszercoaching módszertan elméleti kutatás, fejlesztés, valamint több évtizedes gyakorlati munka eredménye. A módszertan három területből áll: 1) Rendszertudomány-alapú tudás 2) Egy ütőképes, de könnyen kezelhető modell, amelyet SGS modellnek hívnak (Rendszer a Nagyrendszerekben), illetve 3) Az egyszerű, de szigorú és konzekvens módszer, az SnF módszer (Négyzetek és Keretek). A módszertan segítségével komplex, egymáshoz többszörösen kapcsolódó, egymással többszörösen érintkező és egymást átfedő nagyrendszerek síkban kiterített térképét készíthetjük. A Rendszercoaching nem minősíti a felhasználókat. Megmutatja, hogy az S-rendszer valódi célállapota milyen távol van egy bizonyos GS_i nagyrendszerben a saját képzeletbeli céljaitól. A módszertan iteratívan feltérképezi és felsorolja az idő / anyag / energia kereteken belüli szükséges tennivalókat. Rendkívül rugalmas, kombinálható minden más konzekvens és helyes módszerrel, amelyek nem mondanak ellent a fizika és a rendszertudomány szabályainak.
A folyamat mostanra elérkezett egy újabb szakaszhoz: a Ziegler-Rendszercoaching módszertan már eléggé kidolgozott ahhoz, hogy a saját lábára állva segítse a tudósok, vezetők és ügyfelek szélesebb körét. Ugyanakkor egy módszertan soha nem lehet teljesen kész, végleges. Bármely friss felfedezés a fizika világában, minden újabb gyakorlati tapasztalat, minden egyes felhasználó, az összes konstruktív vélemény elősegíti a módszer továbbgondolását, hozzájárul a tudományos háttér fejlesztéséhez és az esethalmaz feltöltéséhez, a módszertan tökéletesítéséhez. A következő szakasz pedig még az eddigieknél is fontosabb lesz: a módszertant széles körben támogatni képes „*Rendszer-Guide*”-ok képzése.

Kulcsszavak: *Rendszercoaching*, komplex rendszerek, RPA, új módszertan, változáskezelés