THE ADVANCED SYNTEGRATION AS THE MOST EFFECTIVE AND EFFICIENT TOOL FOR LARGE-SCALE DISASTER RESPONSE COORDINATION

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A more interlinked world needs more effective organizations. Cybernetic management entails completely different, innovative and creative solutions for any organizational network or parts thereof that the methods used today cannot provide. As the science of effective organization it shows how to control complex systems in a holistic manner. Originating in the field of System Sciences its pioneers were Norbert Wiener (1948) with 'Cybernetics: Or Control and Communication in the Animal and the Machine', Stafford Beer with the Viable System Model (Brain of the Firm, 1972) and the Syntegration (Beyond dispute, 1994). Besides Cybernetics, the systems sciences entail the systems approach, operations research, general systems theory, system dynamics, learning organizations and total quality management.

Using nature's knowledge to overcome increasingly complex problems it induces self-organization and self-regulation, the most prevalent natural laws. It is used in today's organizations to enhance decision making and effectiveness and efficiency of given resources using the best drivers of the system instead of losing the power inherited in an organization. Even dying systems can be revived and brought back from their coma-like states. Management cybernetics is the concrete application of natural cybernetic laws to all types of organizations and institutions created by human beings and to interactions with and within them. Figure 1 shows its main stance: The whole is greater than the sum of its parts.

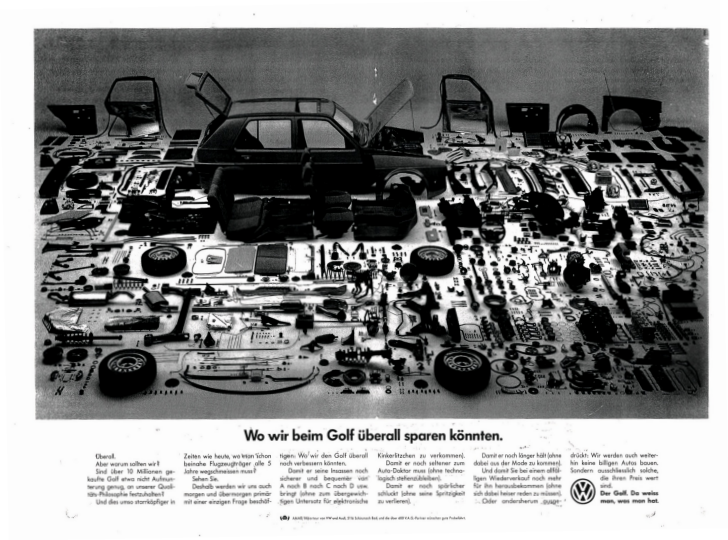

Figure 1

Figure 2 represents two concrete applications of natural cybernetic laws in bionics on the example of using the shape of box fish in aerodynamics and the dirt-repellent properties of the Lotus plant. Bionics takes nature's solutions of 4 billion years of trial and error processes and turns them into optimal solutions – most effectively and efficiently.

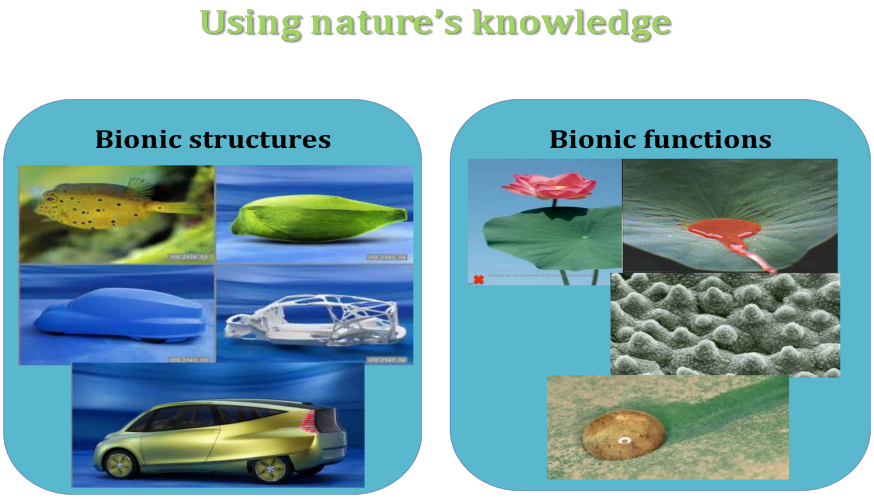

Figure 2

How does this relate to crisis management under high complexity? The question here is: how many problems can be solved simultaneously? How many people does it take? And how fast can it be done? It depends on the method and the interconnections. Linking people in a chain produces „noise and distortion" A → B → C → D → E. Facing high complexity conventional methods inevitably hit the wall in large systems and fail in the face of the complexity of dynamically interconnected systems. Conventional project procedures entail a year-long cycle of sequential rather than simultaneous methods. The cybernetic challenge ignored most often is that change in organizational networks takes place faster than solutions can be developed. The collective team is never informed as such because new and different people come in and leave the network constantly. The Advanced Syntegration integrates the most important advantages of both conventional methods: the small group and the large committee. Several small groups encompass little knowledge and reach their limit quickly while being hard to coordinate with each other. Within themselves they work fine, but their collective tacit knowledge remains unused. The resource knowledge is lost and with it the remaining power that can jolt an organization and bring it up to speed to deal with the complexity and velocity of change in the environment of today. In large committees, a lot of knowledge, experience, intelligence and power is present, but it is very inefficient. There are other large-scale communication processes, such as the U-Process (Senge, et al., 2004), but since they run over several months, there is no possibility for top decision makers to bear with the process due to time constraints and related opportunity costs. Conventional project procedures entail a year-long cycle of sequential rather than simultaneous methods. The cybernetic challenge ignored is that change in organizational networks takes place faster than solutions can be developed. The collective team is never informed as such because

new and different people come in and leave the network constantly. In a disaster situation, there is specifically the need for a fast process, which the Advanced Syntegration can deliver.

Large-scale catastrophes, so-called high-impact low-probability (HILP) events, such as the Japan disaster 2011, the earthquake in Haiti 2010 or the Asian Tsunami 2004 have an extremely high complexity and cannot be planned for beforehand. Natural disasters by itself are already hard to predict, and the possible disaster situation to respond to cannot be predicted since the economic, environmental and socio-cultural vulnerability adds to its uncertainty. Even the complexity of the best to-be-foreseen events cannot be kept under control: hurricanes can be predicted the most accurate since the possible paths can be tracked before landfall for about 5 days.

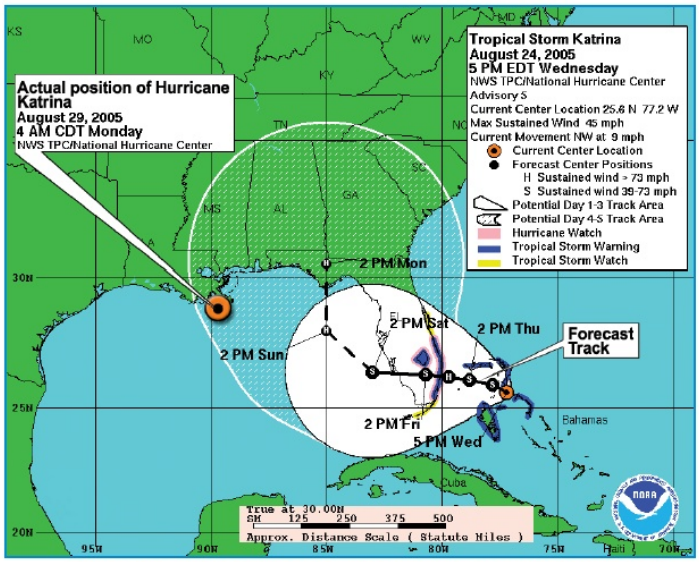

Figure1. Coastal Watches/Warnings and 5-Day Cone Forecast for Katrina issued 5 PM Wednesday, August 24, 2005/NOAA

Figure 3: Track of Hurricane Katrina 2005

Figure 3 shows a product that provides the actual chance for every location of experiencing at least tropical storm (39 mph or greater) sustained winds over the following five days. The white and hatched regions are the cone of uncertainty, which show the average track errors during the last ten years superimposed on the "skinny black line" which represents the forecast track for the center of the storm. Improvements in forecasts make the storm track 66% reliable within a five day forecast. This tool takes into account uncertainty in track, peak winds, and the size of the storm and explicitly gives information about the possible wind impact at individual locations [U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, 2006]. With those levels of uncertainty in mind, we have to add the complexity of the disaster management response.

After a HILP event, a plethora of organizations with different structures, processes and socio-cultural mindsets have to coordinate under the pressure of loosing lives by the minute. A multi-stakeholder decision, coordination and implementation process emerges with extremely high complexity and there is no possibility to plan for such engagement

beforehand since the variety – the possible states of the system – is so high that is not to be forecasted – neither on nature's side of the impacts or on the organizational side of the response. The case study of a catastrophic hurricane on O'ahu, Hawai'i with 1 million people on-island and without feasible evacuation options should demonstrate the details of complexity at hand and the response capabilities the Advanced Syntegration to match this variety explosion. Overall, the hurricane risk for a strong hit or near miss on O'ahu lies at about 1-3%. This probability seems low, but risk is mathematically constituted by the probability of an event times the magnitude of the consequences of the event. Consequently, the severity of the impacts needs to be considered. As the vulnerability analysis of this case study showed, those impacts would be catastrophic (Reissberg, 2010). Nature has solutions in dealing with exactly such situations, but before I introduce those valuable insights of bionics, I want to report on more detailed challenges that arise in such seemingly unsolvable multi-stakeholder coordination problems. This situation calls for collective intelligence and real-time cooperation.

Those results stem from the study of the hurricane hazard management system of the State of Hawai'i for a scenario of a Katrina-like storm hitting the island of O'ahu with metropolitan Honolulu. Over one million people inhabiting this island face no possibility of evacuation, 80% of infrastructure failure and loss of power for several months. To get into the response range for such environmental disturbance, a network of organizations is supposed to follow a specific coordination format, which in practice fails in high complexity situations. The structural diagnosis through the cybernetic tool 'the Viable System Model' (Beer, 1994) came to the following results with the suggestion of using the Advanced Syntegration to remove inefficient and ineffective patterns:

The biggest challenges of such large-scale catastrophes are mass care (sheltering, evacuation, health care, water & food) and infrastructure (power, communications, transportation) including the first step of debris removal. The local government is overwhelmed, assistance from governmental, private and NGO relief agencies pour in as well as international donation efforts. Consequently and realistically over time, enough resources in financial and physical terms are available. The worldwide media drove huge efforts in pulling together resources for events such as the Asian Tsunami 2004, for example. On a smaller scale, Hurricane Katrina 2005 in New Orleans made it obvious, that within the United States there definitely are enough resources to not have a hurricane turn into such a catastrophe with over 1500 deaths. It has therefore been clearly seen that the speed of coordination is key to highly reducing the vulnerability of any given area, exposed to any given event. Throughout underfunded governmental and other organizations were emphasized, but the tacit resource collective intelligence is untapped. Taking the ant colony as an analogy, neither the single ant nor the queen knows or is aware of the functioning and of the whole nor would they be able to consciously control its complexity, but the collective intelligence of the whole give emergence to the complex functioning of the colony: the whole is more than the sum of its parts – the foremost important law of cybernetics.

Further, with a hierarchical structure a lot of power inherited in an organization is lost. Information can be used as an alternative to authoritarian control and the process can be steered with information, not power. This cybernetic principle can be observed currently in the revolutionary processes in the North-African states where information

evidently is more important in the process than the hierarchical power structures. Within an Advanced Syntegration, the hierarchy is broken down, but it is still a democratic process. Information is spread throughout and new ideas flower that can be turned into reality because all stakeholders do have their thinking represented knowing all constraints and opportunities overall. Political power struggles resolve themselves due to the self-organizing and self-regulating power of information and collective intelligence and consciousness. Without a non-sensical hierarchical structure and free information flow – at least during the Advanced Syntegration – frustration can be eliminated and local knowledge appreciated on the long run. This was specifically important for Hawai'i because the federal entities in place for a catastrophic disaster were overwriting local decision-making due to following their protocols, which was very ineffective and time and resources were lost until those power struggles were resolved. With clear information, the federal level would know why to follow local decisions – namely precisely because local authorities know the conditions in the field and the socio-cultural landscape that can be key in if certain measures will work or not. Time-consuming power struggles on, for example, location of Emergency Operation Centers, are eliminated and time – a highly valuable resource – is saved and set free. As unrealistic as is might sound, in Hawai'i, high pet density among the population and their unwillingness to evacuate without their pets made local authorities arrange for pet-friendly sheltering, even though they are aware that they are short of shelter spaces for the entire population.

Figure 4

A real killer of effectiveness and efficiency is ignorance of important aspects leading to, e.g., unrealistic damage scenarios and therefore response capabilities. At a regional conference it was stated, that Honolulu International Airport would be used after a catastrophic hurricane, which was rendered impossible by the damage scenarios – planning like this is impossible. Figure 4 shows the airport scenario before and after landfall during the debris management seminar attended by some of the people of the regional conference.

The Advanced Syntegration

Real-time collective intelligence is needed to create opportunities otherwise unknown and lost. Here, complexity can be used as an advantage – namely using the complexity of the group to meet the environmental challenges. Another obstacle was the combination of the military command-and-control vs. the consensus-based governmental thinking. In nature, adaptation is the higher form of learning and a collective team spirit is created through collective learning during an Advanced Syntegration. The training on the implemented structure and processes was not completed during the research phase, which is the basis of possible functioning. This has to be ensured besides using an Advanced Syntegration while it can provide the how, who and when of these processes and structures of training programs. A big driver of complexity causing variety explosions was the incompatibilities of the systems such as IT, geographical distinction or forms for damage assessments, for example. Co-creating ideas despite of the variety and complexity and using the complexity of the stakeholders instead of being overwhelmed by the system's variety is the solution. The Advanced Syntegration solves exactly this problem creating accepted solutions and commitment through interconnected thinking and synergies. From an IT perspective, solutions are available nowadays, but those hindering processes of miscommunication and power struggles hinder its useful implementation. The Advanced Syntegration resolves those obstacles in three and a half days. Through the participative character of this process an extraordinary strong implementation will perpetuates the outcomes of the event with an implementation rate of 80% of all measures within one year. The number of measures of the resulting action plan ranged anywhere from 40 to 100.

The Advanced Syntegration is a revolutionary highly innovative tool based on 30 year research tradition in cybernetic management. Its power derives from the combination of simultaneity, interconnectiveness, participation and speed. It has three parts: an innovative cybernetic communication process for knowledge and intelligence enhancement; holistic management systems for effective and efficient functioning of organizations; a menu of simultaneously implemented cybernetic instruments to control complexity. Its holistic character integrates 4 dimensions: the technical, cultural, management/control and the time level. It uses the power of up to 40 key players and their collective knowledge in the intelligence-enhancing, brain-interlinking architecture of the Syntegration, which is the interaction of System 3 and 4 of the Viable System Model (Beer, 1972). Its structure is based on Bucky Fuller's geodesic domes and has the form of an Icosaedron. Malik (2011) added to Beer's Syntegration (1994) a bouquet of cybernetic tools applied during the process of the Syntegration to more holistically investigate the system under cybernetic lenses of structure, strategy and culture. Specifically the soft factors play a speed-enhancing role in the process. The implementation will resulting from the psychological healing process of the organization gives the method the power to reach an average of 80% implementation rate in one year, based on over 500 applications accomplished by Malik Management St. Gallen so far with organizations of up to 100'000 members (see Figure 5)(Malik, 2011). Some of the measures achieved the agreed goal two- or three- fold. For example, the biggest German trade cooperation with 110'000 employees and a revenue of over 30 billion € wanted to save 50 million € through the action plan. Instead, 150 million € were identified in those three and a half days whereas before within 15 months 120 million € were identified with an unimplementable action plan. Those large-scale achievements in the business sector are mirrored with equally valuable results in the governmental and non-profit sectors. The

Bavarian city of Fuerth, for example, was insolvent by July 2010. Through the Advanced Syntegration cutting cost potentials and realizations were implemented by December of the same year so that the city was able to keep its financial independence and turn insolvency around. The Canadian Blood Service collecting approximately 850'000 units of blood annually achieved the nationwide pandemic planning and by ensuring clean blood supply rebuilt the Canadian's faith in the nation's blood supply by infusing transparency into its structure, culture and operations. Overall, an organization changes already within the three and a half days and those changes manifest themselves in measurable results during the implementation phase over the course of the following months.

The Advanced Syntegration delivers the setup to coordinate disaster management efforts and enhance resource effectiveness and efficiency related to time, money and manpower enormously to help victims more quickly and therefore creates a speed-up process to save lives. All knowledge and experience can be surfaced. Unthought-of possibilities and opportunities are revealed with all key organizations involved. Through achieved consensus, trust, commitment maximum implementation power is gained and resources in terms of time, money and manpower can be saved and set free for the maximum of effectiveness and efficiency of intelligence, time, and resources. It can be used as a tool to set up the most efficient and effective disaster response for catastrophic events – in as short as two and a half or three and a half days, organized right after the event.

Effects of a Malik SuperSyntegration®

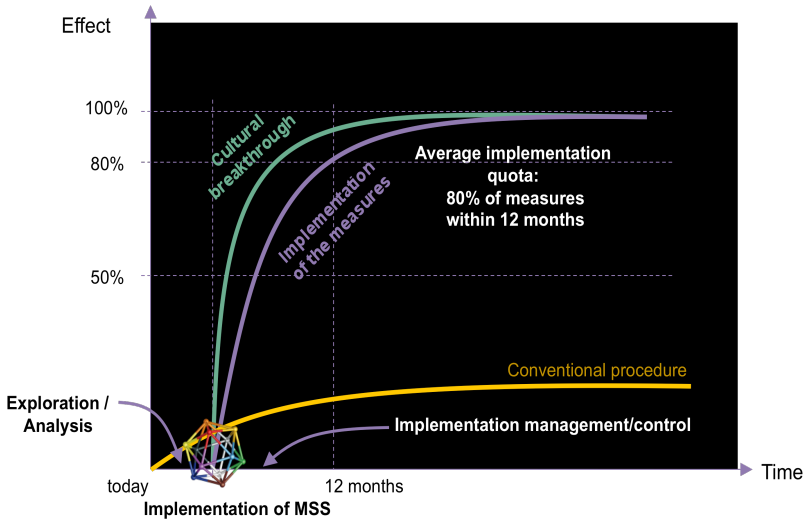

Figure 5

The decision process is speed up 100-fold and the people effectiveness is enhanced 80-fold using the relevant knowledge of the critical mass. Usually, a project plan of 40-100 measures is discussed and implemented throughout one year (365 days), whereas the Advanced Syntegration takes care of this process within three and a half days, which is

about 1/100 of one year. The 80-fold effectiveness is derived from the fact that with usual workshop formats with an average of five employees, the number of relationships add up to 5 (people) times 4 (people) = 20 relationships. The Advanced Syntegration handles 42 (people) times 41 (people) = 1722 relationships. The number 42 comes from the maximum distribution of people on the Syntegration architecture of the icosahedrons, which will be explained in detail later on. The down-scaling is a simplification and takes into account that workshops hold sometimes more than 5 people.

Bucky Fuller's geodesic dome constitutes the bionic power of this architecture. The process is structured along the Icosahedron (Figure 6) constituted by 12 corners and 30 vertices in between. The start and core of any Syntegration is the Opening Question. For the response to a HILP event the following is suggested: How can all organizations be coordinated in the most efficient and effective way within the next 12 months ensuring the maximum benefits for the impacted population? This generic opening question needs adjustments depending on the disaster type, regional settings and needs of the impacted. The corners of the Icosaedron constitute the 12 topics of the Advanced Syntegration to be reached after the information filter process on the first half day. The participants, in color, are represented by the vertices; five participants belong to one topic or corner. This way, all topics and people are equally interlinked. A total of 30 participants hence are active in an Advanced Syntegration, but due to its architecture, a total of 42 participants can be housed by occupying 12 vertices with two participants. The opening question mentioned above would constitute the Mother Syntegration with an outcome of an action plan with on average 60 measures (see Figure 6)(Malik, 2011).

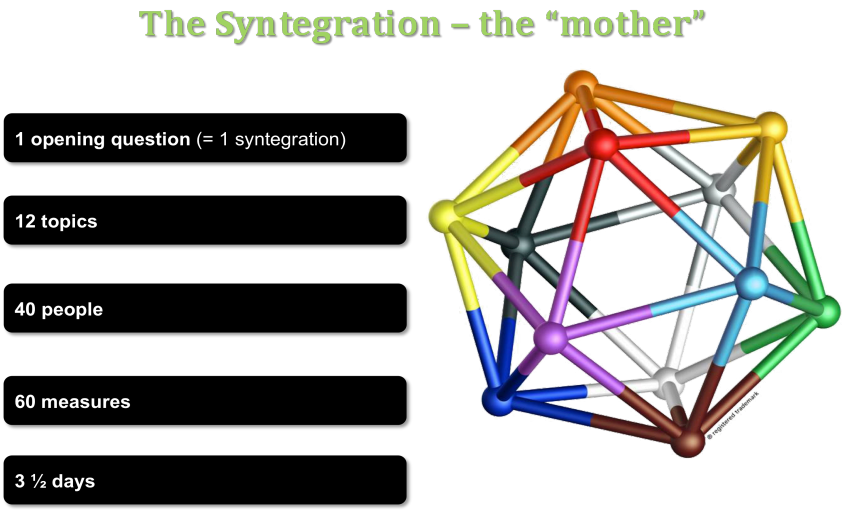

Figure 6

Examples of 12 such topics could be Transportation, Communication, Public Works and Engineering, Firefighting, Mass Care, Housing, Emergency Assistance and Human Services, Resource Support, Public Health and Medical Services, Urban Search

and Rescue, Oil and Hazardous Material Response, Agriculture and Natural Resource, Energy, etc. Due to the immense complexity at hand in response to a HILP event, of course 12 topics and a maximum of 42 participants will not deal with the overall variety.

Due to its architecture and process from the Mother Syntegration, 12 Daughter Syntegration emerge through the 12 topics of the Mother Syntegration (Figure 7)(Malik, 2011). Overall, a Mother Syntegration will be performed with the key personnel of each organization with the outcome of focus topics and an action plan. Those elements will turn into a roll-out system of Daughter and Grandchildren Syntegrations that can cope with the variety in terms of strategy, structure and culture of those organizations and the environmental impacts at hand. The big power and speed of the process is grounded in the simultaneous development of those participatory action plans. Like Russian dolls this roll-out structure allows the system to become aware and focus on the most effectiveness- and efficiency-enhancing measures. The cybernetic tools such as the Sensitivity Model and the Management System Audit support and verify these foci providing a check on the holistic and synoptic view in regards to the highly complex challenge.

Figure 7

For example, the topic ‘mass care’ as a daughter Syntegration can develop the following opening question: How can we overcome a shortfall of shelter space for 100’000 people while ensuring safety before, during and after a catastrophic hurricane? The information filter will break this question down into 12 topics (the corners of the Icosaedron) and the 42 participants will agree on another action plan with an average of 60 measures within those three and a half days. Figure 8 (Malik, 2011) shows roll-out calculations of topics, measures and participants involved including the time line in which this immense variety generation is possible. With 144 Grandchildren Syntegration, around 5’800 participants can be involved in the timeframe of about 4 months having turned around 1700 measures into an implementable action plan of which 80% are to be

expected to be accomplished within one year. Looking at disasters such as the Asian Tsunami 2004 and the ongoing response over the many years to come, this would be an immense increase of effectiveness and efficiency. The Sensitivity Model (Sensimod), one of the cybernetic tools applied during an Advanced Syntegration, will provide an efficiency index for each measure of the action plan, so that resources spent can be followed-up on.

Facts – 4 Generations

	1st Generation	2nd Generation	3rd Generation	4th Generation
Key Questions	1	12	144	1'728
Topics	12	144	1'728	20'736
People	40	480	5'760	69'120
Measures	60	720	8'640	103'680
Days	3,5	7	84	1'008
Number of Measures per Day	17	102	102	102
SensiMod	1	12	144	1'728
VSM	1	12	144	1'728

MSS² (Syntegration+VSM+Sensitivity Model+Operations Room+wholistic Management Systems)

Figure 8

To emphasize why the Advanced Syntegration is an ideal method to solve this post-disaster challenge of multi-organizational disaster management coordination one has to be aware that large-scale disasters (HILPs) remain complex emergencies for an extended period of time and the probability of repetition of one specific disaster is very low, therefore no proactive planning will ever be able to prepare sufficiently for such an event. Three and a half days of involvement of the key decision-makers of all major organizations is an investment in terms of time with great pay-off in terms of effective and efficient resource use on the long run. The information boost through the collective intelligence will be the best pay-off of such efforts. Resources are saved by right prioritization and right resources allocation. A major enhancement of effectiveness and efficiency with given resources will be supported by results on the cultural level, namely consensus and top commitment because the process is free of hierarchy, but still democratic. A boundless will for implementation through acceptance of the decisions emerges into a „fighting spirit" - from „it can't be done" to „we can do it" because the single stakeholders can see what their contribution to the whole result is – at one sight.

Overall, the effective and efficient results on the control and management level are based on finding the parameters for implementation and installing a management GPS for navigation through the Advanced Syntegration. The simultaneously applied cybernetic tools represent a check of the single management systems for performance while setting

up the implementation machine for results. Operations rooms ensure a fully integrated evaluation of the situation, real-time control and an overview for controlling and steering measures. In order to ensure that the system thinking that has developed is sustained in the long-term by the participants, training in system thinking and teaching the Syntegration format is the bionic self-organizing and self-regulation element that makes hierarchical control unnecessary over time. The Ecopolicy game is part of the training of system thinking. Figure 9 (Malik, 2011) shows in short the recursively networked control models that cover all blind spots and synergize structure, strategy and culture.

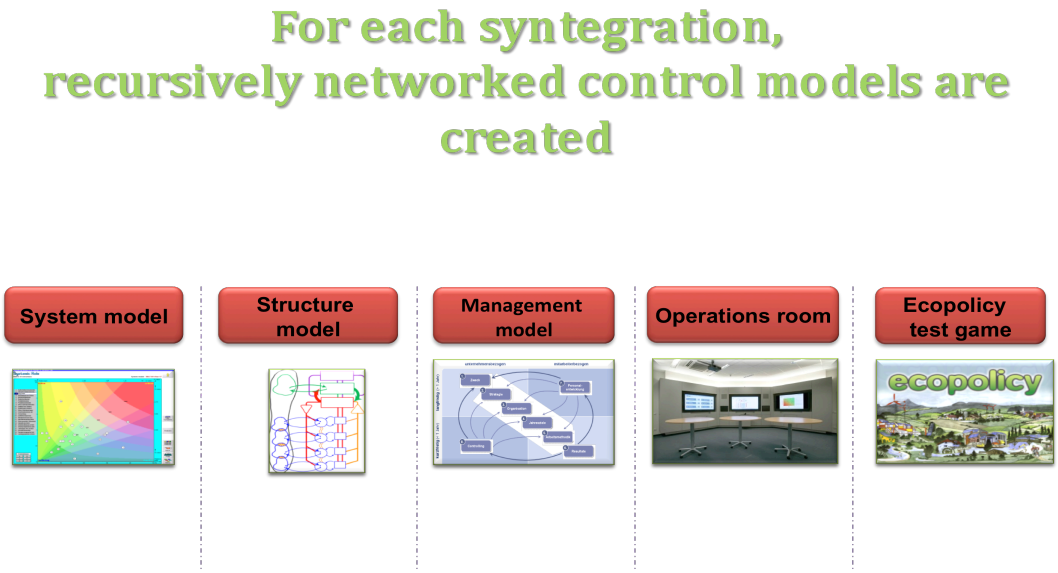

Figure 9

Ultimately, the outcome of the Advanced Syntegration lasting three and a half days is an action plan that all key stakeholders agree to due to them being conscious about their active contribution. This understanding helps and promotes giving up power struggles and changes the participants' perspectives. Even uncomfortable facts are accepted due to the synoptic view of its necessity for the achievement of goals and the good of the whole. Knowing that without that contribution the Opening Question will not be reached gives the right perspective to accept the consequences of the measures. Obviously, they agreed to the goal of the Opening Question and they know about their importance due to their selection into the infoset of a maximum of 42 people to work on this challenge. The needs of a large-scale post-disaster coordination challenge can be met by such intelligence enhancing process to use the resources in place in the best possible way. As a matter of fact, the response to a HILP event will remain an ad-hoc reaction even with the best preparedness possible. To get this variety explosion under control – variety being all possible states of a system – the Advanced Syntegration is a template to plug all organizations – any type from governmental to non-profit and private sector – into and coordinate them in the most effective and efficient way.

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