

Janie Chroust, 2010



International Federation For Systems Research

"Systems for Education, Engineering, Service and Sustainability"

> **Proceedings of the** Fifteenth IFSR Conversation

G. Chroust, G. Metcalf (eds.)

April 10 - April 15, 2010 **Kloster Pernegg (Austria)**

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Welcome to the IFSR Conversation 2010!

Like all organizations today, the IFSR is challenged to stay current with the ever-evolving needs of its members and stakeholders. The First IFSR-Congress in Kobe, Japan, in November 2004, the Fuschl Conversation 2006, and the Strategy Day 2010 all helped to create a new vision for IFSR's position, role, and mission in this continually more complex, more interdependent and more collision-bound world. A part of accepting this challenge meant the IFSR increasing its role in promoting Systems Thinking.

As one of our strategic levers we identified the bi-annual Fuschl Conversations. We saw them as a nucleus of international interactions and strategy formulation for the future allowing IFSR to achieve the new goals and challenges.

As a consequence we put more emphasis on identifying relevant topics with respect to practicability and usability for the Systems Movement at large and for IFSR as one of the key players.

Another change was to try to make the Conversations more effective by providing a more professional, workshop-like infrastructure which was not sufficiently present in the traditional Fuschl set-up: we decided to look for a new location. It should be nearer to Vienna to enable participants in the IFSR Board Meetings and in the EMCSR-Congress to reach the location more easily.

After a considerable effort for searching I was lucky to find Kloster Pernegg, which satisfied our demands on the Conversation location much better. The village of Pernegg is located approx. 100 km northwest of Vienna. It can easily be reached by car in 90 minutes and by train in 2,5 hours from the center of Vienna center and Vienna Airport. What is now a seminar hotel is located in the buildings of a former renaissance monastery which looks back at a history of more than 850 years. It was completely modernized and refurbished in the 90s. It is embedded in a wonderful, almost untouched landscape. This location provides a focused and inspiring work atmosphere. Details on the location can be found at www.klosterpernegg.at.

As a consequence we could not use the name 'Fuschl Conversations' any more: the decision was to call them henceforth 'IFSR Conversations'.

After considerable discussion the following four basic topics were chosen

- Creating Systems Education Curricula
- The Science of Service Systems
- Learning Systems for Sustainability
- Systems Science and Systems Engineering

Consistent with the rules for Conversation, the team modified their topics in relation to the course of their deliberations.

This booklet contains the proceedings of the 2010 IFSR Conversation in Pernegg and summarizes the findings of the discussions.

The proceedings open with a short review of the history of the Conversations from their beginning in 1980 until the present Conversation. This is followed by the reports of the four teams (some of them augmented by individual papers contributing to the team's findings. Some overall information about IFSR concludes the booklet.

The proceedings are also available for reading and downloading at the IFSR's homepage at http://www.ifsr.org. Pictures of the Conversation, showing both the hard work and the ambience can also be found there.

Looking at these proceedings I am proud that we can show that the IFSR – with the help of the IFSR Conversations - will be able to even better serve the systems community and thus promote systems thinking.

I want to thank the Conversation's Programme Chair, Gary Metcalf, for supporting and streamlining the selections process for the topics and candidates. My thanks also go to all participants in the Conversation for their effort and especially to the Team leaders: Ockie Bosch, Kambiz Maani, David Ing, Alexander and Kathia C. Laszlo, Yoshi Horiuchi, and Gordon Dyer.

I enjoyed being in Pernegg as part of the Conversation and I believe that we achieved at least a small contribution to the world of Systems Thinking.

Gerhard Chroust (Austria) Secretary General IFSR April 2010



Gary Metcalf, Gerhard Chroust (editors)



End of a Session and the famous traditional singing event at the Conversation

Looking back at Pernegg 2010

Gary Metcalf (USA), Gerhard Chroust (Austria)

30 years is a long time for a small conference or workshop to survive. We can be proud that the Fuschl Conversations still exist and show their usefulness.

When looking back on the history several phases can be distinguished¹:

The initial phase (1980 – 1994) which could be mainly seen as a personal experience attended phase. Participants the without attempt conversation any disseminate afterwards their results to the outside world in a formal way. These conversations were driven by the charismatic personality of Bela H. Banathy. centered on the general area of social systems design. The participants profited from Fuschl mostly as individuals (As Charles Francois remarked: "When you leave Fuschl, you are a different person").



- By 1996 it was decided to give the Fuschl Conversation a little more structure and transparency. A formal Call-for-Participation and a participant selection procedure was introduced, accepting around 28 participants in 5 to 6 teams, still discussing various aspects of Social Systems Design. A short version of the results was published soon after in the IFSR Newsletter, a more detailed report together with accompanying 'think papers' was published as proceedings. We may call it the dissemination phase.
- When Bela was unable to join us in Fuschl from 1998 onwards, his spirit kept the Conversations going but gradually the ideas got somewhat diluted, and we reached a 'diversification phase'. Social Systems Design was not the only focus any more. Also many participants discussed topics which were not really 'theirs'. At the closing of the Fuschl 2004 Conversation a certain feeling of uneasiness about the validity and the relevance of the Conversation was felt.
- 2005: This development coincided with another change to the IFSR. Initiated by IFSR's then President Jifa Gu, the IFSR Board decided to hold its first Congress in Kobe, Japan, in November 2005, at the request of our new Japanese member, the International Society of Knowledge and Systems Science (ISKSS)². This congress will be remembered as a turning point in the history of the IFSR: For the first time IFSR was willing to really take a lead in the Systems Movement, we entered the *integration phase* for the Fuschl Conversations.
- 2006: The vision of the IFSR's new role could only be realized by achieving a consensus between our members and by an evaluation of the situation of the systems movement. We could say that we went into a *strategic reorientation phase*. This gave a new challenging purpose to the Fuschl Conversation: to provide a platform for representatives of our member societies and other prominent scientists to evaluate the state of affair in systems, make some conclusions for the future and to give guidance and direction to the IFSR and its members.

¹ Metcalf, G. and Chroust, G., Fuschl 2006 - Aims and Objectives, in Metcalf, G. and Chroust, G.: Proceedings of the Thirteenth Fuschl Conversation, April 22-27, 2006, Inst. f. Systems Engineering and Automation, Kepler Univ. Linz, 2006, SEA-SR-13}, ISBN 3-902457-13-9, pp. 6-9

Linz, 2006, SEA-SR-13}, ISBN 3-902457-13-9, pp. 6-9 ² Gu, J. and Chroust, G., IFSR 2005 - The New Roles of Systems Sciences for a Knowledge-based Society, Kobe 2005, JAIST Press 2005, Japan - CDROM, ISBN 4-903092-02-X.

We decided that the Conversation-style was the right tool and Fuschl the right environment to achieve our goal. For 2006 we choose topics which were relevant and strategic to the systems movement at large and to the IFSR in particular. We invited representatives of member organizations to suggest participants. The Fuschl Conversation brought numerous suggestions, ideas and actions plans for the future work of the IFSR. The findings and suggestions of Fuschl 2006 can be found in the proceedings³.

- One major impetus was the recognition that IFSR needed a much more interactive and comprehensive Web-site. As a consequence after some deliberations and with assistance from David Ing, then webmaster for the ISSS Gerhard Chroust, the Secretary General, agreed to renovate the website, using a different technology (DRUPAL) and on this basis provide a dynamic communication means for our member societies and for the Systems Movement in general. By November 2007 the new website (http://www.ifsr.org) became operational and is under constant improvement since. One of the major advantages of the new website is the accessibility of much of the information (all past and current Newsletters, all available proceedings of Fuschl Conversations, pictures, etc.) to the general public in a central repository. But we all agreed that this 2006 Conversation was to be a singular event, not to be repeated the next time.
- With 2008 we went a middle ground: We choose (finally) four topics which seemed to be in the center of concern for the systems movement in general but also to the participants. We entered the *topic oriented phase*. All topics were concerned with enabling the IFSR to perform better. We kept the traditional Conversation style. Again the Conversation was characterized by a strong involvement of all participants. In the Conversation we tried to enhance the panel discussions and the cross-team interactions, encouraging participants to join as 'guests' other teams.
- Fuschl 2008 showed considerable difference to the 2006 Conversation. In 2008 operational and practical problems were in the foreground: "How can we achieve...", while 2006 was more concerned with long range strategic visions. Both Conversations established the IFSR as a high-level coordinative player in the Systems Movement and were very helpful in deciding on future directions.
- But we also recognized that we need more changes to keep the Fuschl Conversations sufficiently useful to justify their existence and the associated expenditure in time and money.
- In Bela Banathy's the preparation for a Conversation ideally begins as an outgrowth of a previous Conversation or at least with many months of advance thinking and preparation. A topic is chosen by a team; individual input papers are prepared and distributed to allow the team members to further refine questions and to arrive at some shared understanding of the ideas and viewpoints of other team members. By the time the team arrives at the formal, in-person, face-to-face Conversation, a great deal of familiarity and background should already be established and the team simply moves into an intensive phase of work that has begun.
- In reality in today's environment that kind of collaboration between professionals at great geographic dispersion and with much tighter schedules is difficult to achieve. Those difficulties were part of what had brought the Fuschl Conversations to a critical junction, and became magnified in many ways during the 2006 and 2008 Conversations a reality that was instructive for us going into the future.
- With 2010 some of the above intentions came true: Two of the four topics of 2010 (Team 1 and Team 2) grew out of the 2008 conversation, the third one was initiated at the ISSS 2009 Conference and was integrated into the Conversation (Team 3). The fourth topic (Team 4) was recognized a potential key topic for the future, somehow a test for the ability of Systems Thinking to link up with the world of Systems Engineering.

³ Metcalf, G. and Chroust, G.: Proceedings of the Thirteenth Fuschl Conversation, April 22-27, 2006, Inst. f. Systems Engineering and Automation, Kepler Univ. Linz, 2006, SEA-SR-13, ISBN 3-902457-13-9, pp. 65

With these proceedings we try to convey a realistic and largely un-edited record of the Fuschl Conversation 2008. The style and the level of detail differ depending on the type of group. The reports in these proceedings should be considered as 'work-in-progress'.

Photos from Fuschl 2008

Photos of the Conversation are interspersed into the reports. A considerable larger gallery of photos can be found on IFSR's home page: http://www.ifsr.org -> Photo Gallery!



List of Participants

28 participants from 9 countries were able to attend (team leaders in bold).

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Team 1: Systems Thinkers Think About Systems Education Under The April 2010 (Volcanic Ash) Clouds Of Austria

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Executive Summary

The fragmented nature of systems education with multiple traditions expressed in very different ways at different institutions with ultimate confusing effects on the community of learners (students, managers, policy makers, etc), led to a group of Systems Thinkers to discuss and create generic curricula for education and learning about systems for the generalist and specialist tracks. An active network of systems educators and stakeholders, who can benefit from enhanced systems education in having to deal with complex issues, was also explored. In this presentation some guidelines for designing introductory and advanced courses will be discussed. The Introduction to Systemic Thinking and Practice course is intended as an introductory course for students from all disciplines. The Advanced Systemic Thinking and Practice course is intended as a more advanced course for students who are faced with complex issues that require a trans-disciplinary and integrated approach. The designs contain a set of key systems concepts and frameworks relevant to the appropriate level, along with some indicative tools and methods which will enable students to explore the concepts. The value of a Global Network of Systems Educators will also be discussed and how this network could help to fulfill the needs of managers, policy makers and society in general. An example will be given of how the integration of this network with the UQ-UNESCO/MAB Global Learning Laboratories NET could lead to more people (decision-and policy makers in Governments, managers, businesses, etc.) having the ability to practice systems thinking - all of these contributing to Systems Thinking becoming a more mainstream part of a sustainable society.

Creating Systems Education Curricula

In April 2010 a group of systems thinkers got together at the IFSR Conversation at Pernegg, Austria, for an conversation about systems education. The goals of Pernegg Team 1 were to create generic curricula for education and learning about systems for the generalist and specialist tracks, and to explore an active systems educators stakeholders who can benefit from enhanced systems education for dealing with complex issues. We discussed the fragmented nature of systems education with multiple traditions expressed in very different ways at different institutions, and developed guidelines for



designing two systems courses. The first, ST101 *Introduction to Systemic Thinking and Practice*, is intended as an introductory course for students from all disciplines. The second, ST301, *Advanced Systemic Thinking and Practice*, is intended as a more advanced course for students who are faced with complex issues that require a trans-disciplinary approach. Each course design is intended as an aid to educators, and we expect that educators from different disciplines and systems traditions would adapt it to meet the needs of different students. The designs contain a set of key systems concepts and frameworks relevant to the appropriate level, along with tools and methods which enable students to explore each concept.

The list of tools is partial and indicative, and we fully expect educators to expand the list. We also worked to develop the requirements and benefits of a global network for systems education and systems educators, which could be integrated, for example, with the UNESCO/MAB Global Network of Learning Laboratories for dealing with complex issues._Such a network and its integration with communities of practice could help to fulfill the needs of managers, policy makers and society in general. It could lead to the ability of more people to practice systems thinking, which will also have a ripple effect on others in society – all of these contributing to systems thinking becoming a more mainstream part of a sustainable society. Problem based learning needs to underpin the learning process to support two-way learning spanning staff, students and the community.

We discussed the application of systemic approaches to enhance learning to address areas of concern by applying appropriate theoretical and methodological approaches.

Our aims were to

- Create generic curricula for education and learning about systems for the generalist and specialist tracks
- Explore an active network of systems educators and stakeholders who can benefit from enhanced systems education in having to deal with complex issues
- Explore how we can contribute to fulfilling the needs of managers, policy makers and society in general
- Enable more people to practice systems thinking and to have a ripple effect on others in society, to contribute to systems thinking becoming more mainstream by, for example, linking a Global Network of Systems Educators to the Global Learning Laboratories Network.

The challenge is how to develop systems education curricula that will be of value to different types of students across conceptual boundaries (cultural, political and professional) and spatial boundaries, organisational, community, regional, international). To this end, the discussions included:

- The fact that participation in the use of various methods in problem solving enhances the students learning of concepts and methodology.
- Brain storming in which the group explained why the various components included in the two courses were relevant to systems education.
- The distinction between systems concepts and systems methods.
- The amount of teaching time allocated to concepts, or tools, or examples.



It is important to note that these discussions were very much based on the sources of literature that the team members would regard as important in their own teaching. To mention a few: Bosch et al 2003; Maani & Cavana, 2007; McIntyre, 2006; Smith et al 2007; Ossimitz, 1996; Ramage, 2010; and Vesterby, 2008. The following lists of concepts and tools that resulted from the brain storming session (not in any particular order) could easily be added to by others involved in systems education:

Concepts important in systems education

- 1. Holism
- 2. Context
- 3. Interdependency
- 4. Flexibility/Adaptability
- 5. Resilience and robustness
- 6. System boundaries
- 7. Complexity
- 8. Relationship
- 9. Feedback
- 10.Controls
- 11.Concepts/models of time
- 12.Paradoxes
- 13.Granularity
- 14.Non linearity
- 15.Delay
- 16.Equifinality
- 17.Unintended consequences
- 18. Requisite variety
- 19.Levels of learning single, double and triple loop
- 20.Limitations of models
- 21.Environment
- 22.Emergence
- 23. Multiple causality
- 24. Traps and messes
- 25.Self organization
- 26.Communities of practice
- 27.Root causes
- 28.Ethics and values
- 29.Stakeholders
- 30.Open system
- 31.Throughflow
- 32. Equilibrium, steady state, and homeostasis
- 33. Dynamic behaviour
- 34.System
- 35.Feed forward
- 36.Edge of chaos

Tools that can be of use in systems education (not in any particular order):

- 1. Participatory design
- 2. Metaphors
- 3. Participatory Systems Analysis
- 4. Mental models
- 5. Causal loop modeling
- 6. Bayesian networks
- 7. Stocks and flows
- 8. Examples
- 9. FMA
- 10. Critical Systemic approaches based on matching the domains of knowledge to area of concern
- 11. Scenario planning
- 12. Stakeholder mapping
- 13. Systemic evaluation
- 14. Socio-technical systems design
- 15. Team syntegrity
- 16. Total systems intervention
- 17. Boundaries of exclusion or inclusion
- 18. Exploring perceptions of world views
- 19. Behaviour over time

The members of the group explored the amount of time they spent on concepts, tools and examples /practice. This is summarised below:

	Bosch /Maani	McIntyre-Mills	Ramage	Ossimitz
1. Concepts	15	33	55	25
2. Tools	30	33	25	20
3. Examples/practice	55	33	20	45

2 Formal Teaching and Learning Programs

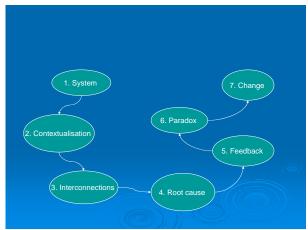
2.1 Outline for an introductory course on systems thinking and practice

The Systems education Matrix developed during the 2008 IFSR Fuschl discussions was shared with the group.

The Systems Education Matrix (Adapted from Jones et al 2009)

	1. Sense-Making Having the ability to use basic systems concepts to make sense of phenomena, objects and processes in the world.	2.1. Practical Understanding Having the ability to competently apply systems concepts for research or practice. The ability to expound upon or teach systems concepts to others and add to knowledge.	2.2. Theoretical Understanding In a position to add competently to the body of systems knowledge (viz. philosophy, theory, metho- dology, and praxis), as well as areas of practical application in specific contexts.
A. Discipline-Integrated Having the ability to integrate systems approaches into one or more areas of application.	e.g. horticulturalist, accountant	e.g. systemic horticulturalist	e.g. creator of knowledge within systemic horticulture
B. Generic Having the ability to understand, apply, and relate systems concepts in multiple contexts and/or to add to the systems knowledge base.	systems student mastery	systems practitioner	creator of Systems knowledge

The SEM was developed to serve as a tool for systems educators charged with designing new university-level curricula that effectively integrate systems concepts and/or teach those concepts explicitly. During the 2010 Conversation we characterised the main issues of systems education (within the above framework) as follows:



- Highly fragmented, both intellectually and pedagogically.
- A need for a first year introductory course that will be applicable to all disciplines to create "the ability to use basic systems concepts to make sense of phenomena, objects and processes in the world" (Sense Making).
- What contents/concepts should be covered in developing a more advanced course for students who are interested in "Having the ability to competently use or apply systems concepts for research or practice (Practical Understanding/Mastery).

The group started to address these two needs by exploring which of the concepts and systems tools earlier mentioned would apply to the introductory and advanced courses. This has been proven a difficult task, as there are far too many concepts (and tools) that students can be introduced to (those mentioned above were only concepts that came to mind during the brain storming session of our small group of educators). The group decided to "cluster" the concepts into broad modules/categories that will need to be addressed to serve as aids to educators. It is important to note these could only be seen as broad guidelines and each educator would adapt them to meet the needs of different students, disciplines etc.

The introductory course consists of a set of concepts and indicative tools. The notes are intended only as some principles for developing a first year course/subject that could be used to guide the development of the learning materials within a particular context. We acknowledge the importance for the materials to be matched to the various contexts in which the course will be delivered.

Learning outcomes will ensure that students understand that:

- The issues facing the world are complex, because **systems** straddle many different factors and involve diverse stakeholders. System's view is predicated on understanding the content and the context (environment) of the problem. This can be explored through participatory processes with the stakeholders using techniques such as Critical Heuristic, Rich Pictures, and many others.
- They will learn about **contextualisation**, by identifying areas of concern within the larger context of their field of study. Contextualization can be explained using Mind Maps, represented by Rich Pictures, stories and pictures.
- Interconnections across different disciplines need to be understood in order to make sense of the convergent social, economic and environmental challenges that we face as stewards for the next generation. Students need to understand, for example, that poverty and pollution are the result of interconnected social, economic and environmental challenges.
- Root causes are based on learning to address the underlying causes rather than seeing and addressing only the symptoms of a problem. This can be explained by means of Causal Loop Diagrams, leverage points and multiple cause diagrams.
- **Feedback** is based on learning to identify positive and negative feedback across components of a system. These can be explained using Causal Loop Diagrams, Influence Diagrams and the paper based computer.
- **Paradoxes** are portals for addressing problems that appear to be intractable by applying systemic theory and practice.
- **Changing systems** (System Dynamics) need to be understood as a core concept that needs to be addressed by applying tools.

2.2 Outline for an advanced course on thinking and practice

The course was designed to serve as a guideline to help students to learn about concepts that will help them towards "mastery of systems practice" and using integrative approaches to work across disciplines:

Identifying issues of concern

Learn how to frame issues as problems, to consider what a problem is, and to distinguish between problems and symptoms, by examining interrelationships across multiple areas of concern, such as poverty and tourism.

Role of ethics and values



Learn about the importance of ethics and values in relation to contemporary issues such as poverty, pollution, children's rights, climate change, women's rights, conflict, family life, resources shortages (such as water and energy), nutrition, the financial crisis, and corruption.

Theories of risk and uncertainty

Learn about how the changing nature of the world impacts upon the way in which people and organisations make decisions.

Integration

Learn how complex problems cannot be solved in isolation within single disciplinary boundaries; learn how to use tools to integrate knowledge and to involve and value the knowledge of all stakeholders.

Working in groups to improve effectiveness, by learning how to communicate and work in teams towards the common good and enable groups to work together to design better futures.

· Emerging forms of organisation

Learn that traditional forms of organisation are inadequate in dealing with increasing complexity and interdependency in the emerging global society. This has implications for organisations of all kinds (public, private and voluntary sectors), from the smallest working group to the largest corporation.

Systems and subsystems

Learn that systems are composed of subsystems, and how to map out relations across subsystems.

• Systems Archetypes (Generic Patterns of systems behaviour)

Learn about generic patterns of systems structure and behaviour, such as the 'tragedy of the commons', 'shifting the burden' and 'fixes that fail'

Tools for systemic thinking and practice

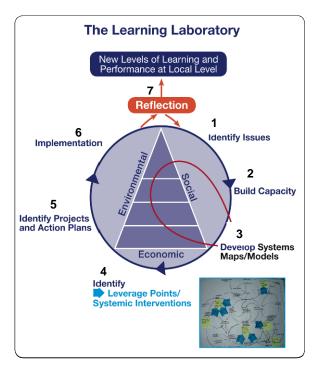
Learn about tools which can be used for decision making and building consensus.

A new way of thinking (Mental Models)

At the end of this course students would have learned a new way of thinking which enables them to become an agent for change.

A typical semester course may be delivered as follows

- Week 1: Appreciation of the pitfalls involved in framing issues. Consider the purpose of the interventions.
- Week 2: Theories of risk and uncertainty
- Week 3-5: Integration and synthesis based on knowledge management
- Week 6 -7: Communities of practice, participatory design
- Week 8-9 Open system, emergence and selforganisation
- Week 10: Scale (granularity) and hierarchy; putting logic into organizations, simple examples, Viable Systems Model.
- Week 11: Nature of systems behaviour and systems archetypes.
- Week 12: Representation and accountability
- Week 13: Fundamental personal mind shift



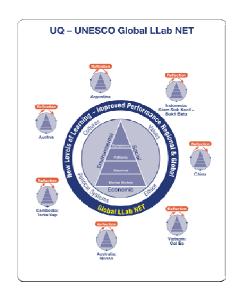
3. Informal Learning through Communities of Practice

The Learning Laboratories for Managing Complex Issues have been discussed as one way of informal learning that could help to make systems thinking more main stream. Bosch explained the Learning Laboratories as a unique process and methodology for integrated cross-sectoral decision making, planning and collaboration in dealing with complex multi-stakeholder problems. The LLab comprises 7

steps⁴ whereby all decision makers and stakeholders come together to develop a shared understanding of complex issues and to create innovative and sustainable solutions. The Learning Lab methodology is a generic process which can be applied to solve complex problems and to create consensus in a variety of domains and contexts, social, economic, environmental and cultural. The wide range and diversity of the LLabs is both a challenge as well as a rich source of mutual learning and progress. Not only do LLabs serve the purpose to achieve a particular goal (for the area or issue under consideration) but also improve cross-sectoral collaboration and sharing of knowledge.

The Global Network of Learning Labs (LLab Net) has been a logical next stage in the evolution of the Learning Labs for managing complex issues. The network links culturally and geographically diverse Learning Labs (e.g., UNESCO Biosphere Reserves around the globe), and LLabs being used as management tools for complex problems in a particular State, Province or Country in a virtual network and serves as their 'nucleus'. This provides an unprecedented opportunity as a global forum for social change.

While each learning lab operates at a local level in dealing with its own complex issues and challenges (e.g. sustainable tourism, environmental degradation, poverty, access to education, maintaining lifestyle, economic growth, etc), the Global LLab Net provides a platform for all the learning labs from around the world to share knowledge, experience and insights in different cultural and political contexts to generate further regional and global learning and ever-increasing levels of performance. The NET also provides LLabs with



opportunities to share their systems models and identified leverage points for systemic interventions (including potential research projects) with Universities and other research organisations – in this way providing research platforms for collaboration with the individual LLabs.

The Global LLab Net operates since 2009 from its base at the University of Queensland and provides and facilitates a variety of services and synergies. These include acting as a clearinghouse for knowledge dissemination, training workshops, coordinating regional LLab conferences, Decision Labs, executive education, sustainability retreats, research projects, student fellowships, sustainability games, international field trips, and more. The Global LLab NET also provides a collaborative learning environment for sharing ideas and knowledge through different cultural and political lenses that will help achieving new levels of learning and improved management performance at regional, global and local level.

A Community of Learning

LLabs from around the world are brought in direct contact with a wide variety of existing scientific networks around the world. For example, by integrating the Network of Systems Educators (that is starting to form through the IFSR Conversations (Fuschl 2008 and Pernegg 2010), ISSS conferences and activities of the ISSS's Special Integration Group (SIG) for Designing Systems Education with the Global LLab a world community of learning could evolve. Bringing the Global LLab, ANZSYS (Australia and New Zealand Systems Group) and ISSS together at respectively annual and biennial reflection meetings will not only bring systems theorists and practitioners in direct contact with each other, but will also have the benefit to serve as one way in which informal learning could help to make systems thinking more main stream

4. General Systems Essentials

Although not discussed in detail during the Pernegg Conversations, Vincent made a useful contribution on his ideas around a Modern Generalist Curriculum. As mentioned above, the goals of our team included the creation of generic curricula for the generalist and specialist tracks in systems education. The creation of ST101 and ST301 fulfilled the goal for the specialist track. The following briefly outlines

⁴ Maani, K & Bosch, O.J.H. Learning Labs For Sustainability © 2010

a proposed eight year Modern Generalist Curriculum leading to a doctoral degree, as an addition to sections 1 to 3 of this report:

An Introduction to a Universal Generalist Curriculum

by Vincent Vesterby

In the modern world there are two levels of generalist understanding. The first level occurs as discipline generalist understanding, wherein a person achieves broad knowledge within a particular discipline, a systems science generalist for example, or a general practitioner in medicine. The second, higher level uses the intrinsic nature of the infinite universe as its paradigm. This level occurs as universal generalist understanding, wherein a person achieves the ability to develop understanding of anything in any discipline by using modern generalist methods. This proposed curriculum is for training universal generalists. General Systems Essentials, the introductory course for this curriculum, can be used by anyone interested in systems science to broaden and deepen their systems understanding.

The curriculum is designed to create discipline-independent general systems scientists (a) who can generate new systems knowledge throughout the disciplines, and (b) who can provide holistic overview of multidisciplinary research and complex issues. Modern generalist understanding will play a supporting role for systems science and systems practice by contributing to quality, rigor, and effectiveness.

The modern generalist mode is based on quality and extent of understanding, which general systems has now made possible, rather than on quantity and extent of knowledge as in the traditional mode, which the ongoing deluge of new knowledge produced by science has made impossible to achieve. Three universal, omnipresent aspects of the intrinsic nature of all that exists provide the modern generalist mode, its ability to achieve discipline-independent breadth and depth of understanding.

- ❖ General factors—A developed understanding of general systems principles and isomorphies. A general factor is anything that exists and plays a role in the intrinsic nature of reality in two to many different situations.
- ❖ Structural logic—The manner in which the intrinsic qualities of something that exists determine the kinds of relations that something can have with other things that exist, which determines the patterns of organization of all that exists.
- Development—The sequential order of relations between all that exists, throughout space and structure, throughout time and process. It occurs as a consequence of structural logic. Because these three are intrinsic aspects of that which exists, they orient the mind to realistic objective understanding, and away from the misconceptions derived from the subjectivity of all forms of anthropomorphism and anthropocentrism.

General factors, structural logic, and development exist as patterns of material structure and process. A modern generalist thinks in the mode of these patterns of organization, that is, in the intrinsic mode-of-being of that which is thought about. When doing so, the boundaries of the disciplines fade away. The modern generalist is then working in a discipline-independent manner. Discipline-independent understanding results in the emergence within the mind of another component of the modern generalist intellectual tool kit.

The modern generalist universal conceptual model—is a universally holistic, threedimensional mental model of structure and process that orders all knowledge according to the natural interrelationships of the reality referents of that knowledge.

There are three further components of the modern generalist tool kit that orient the mind to realistic objective understanding.

- ❖ Biological epistemology—The recognition that experiencing, knowing, and understanding are biological in nature, the emergent products of biological evolution, and have been honed for hundreds of millions of years to be tools of particular effectiveness in detecting, analyzing, and interrelating with the biotic and abiotic ecological conditions in which our ancestors lived.
- Realist philosophy—Realist philosophy is about achieving understanding of that which exists. A modern generalist is a scientific philosopher who uses existing intrinsic aspects of reality to explore, analyze, understand, and describe that which exists.
- ❖ Prime imperative of analysis—Look to the subject of investigation itself. Let the intrinsic nature of reality dictate the nature of the understanding of reality. Analyse the reality referents of concepts, rather than the concepts themselves.

This generalist mode does not simplify complexity, but instead accepts it for what it is, enters the complexity by way of known general factors playing roles therein, observes what else playing roles of structure and process is there, and thereby achieves understanding of the intrinsic nature of the complexity.

General Systems Essentials introduces the student to this mode of developing understanding through practical, hands-on use of these tools, opening the way to deeper generalist understanding. The full Modern Generalist Curriculum provides a longer term developmental path to provide the student with a modern generalist skill set, a skill set largely absent in modern science—that of the discipline-independent universal generalist.

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⁵ Members of the Team are in bold.



Team 2: The Science of Service Systems

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This team discussing the *emerging science of service systems* extended conversations begun at ISSS Brisbane in July 2009 (Bosch, 200), and continuing at the Tokyo Institute of Technology in March 2010.

In "steps towards a science of service systems" (Spohrer, Maglio, Bailey and 2007) it is stated that "the service system is the basic abstraction of service science" (Spohrer, Vargo, Caswell, and Maglio 2008). The *IFSR Pernegg Conversation* presented an opportunity to convene leading researchers in the systems sciences toward an appreciation of service systems as part of the "new economy" of the 21st century (OECD 2000, 2007).

With industrial production having been the dominant mindset of the 20th century, the advent of the Internet and globalization has presented new opportunity and challenges for scientists, engineers, managers and designers, and the education and training programs through which knowledge is disseminated. The exploration of services science from a perspective of the systems sciences has been seen by conversation participants as a relevant knowledge development domain. Four of seven Pernegg team members had contributed to the Brisbane and Tokyo conversations, enabling some continuity in learning combined while generating additional energy through the sweeping in of additional perspectives.

The conversation began with self-reflections on personal experiences leading each of the individuals to the systems sciences, acknowledging the influence of those trajectories on their perspectives on service systems. In recognition of this science of service systems as a potentially a new paradigm, much of the time together was spent in sense making about the intersection between ongoing services research and systems sciences perspectives. This sense making led the team to focus the dialogue more on posing the right questions to clarify thinking broadly, as opposed to diving deeply towards solutions that would be tied up as issues within a problematique field.

During the conversation, the progress on ideas was recorded on flipcharts. Nearing the end of our time together, the team cut up the flipcharts with scissors, and collated the discussion threads into five clusters:

- (i) philosophy; (ii) science; (iii) models; (iv) education; (v) development. With service systems as a new domain, the team found all five clusters underdeveloped. Recognizing that all five clusters are coevolving, the phenomenon of service systems was listed in order from the most concrete (i.e. development) through the most abstract (i.e. philosophy). Each of the five clusters was then summarized by a meta-question.
- 1. Development: How do we transition from the current paradigm?
- 2. Education: How do we help others learn about service systems?
- 3. Models: How do we understand and describe service systems?
- 4. Science: What do we know about service systems?
- 5. Philosophy: Why do (or should) we care about services systems?

Each of the meta-questions is described below, with some of the dialogue content associated with the question clusters.

1. Development of service systems: How do we transition from the current paradigm?

For the majority of the world, the interest in service systems is practical. Shifts in technology, economies and societies impact our jobs and our lives. We recognize agrarian societies (e.g. groups prior to industrialization or unimpacted by that revolution) and industrial societies (i.e. with the rise of machines). The service economy, particularly segments associated with new information and communication technologies (e.g. the Internet, mobile telephony) has not yet been universally labelled (e.g. post-industrial society and post-modern society) can have other connotations.

The label of (new) service systems was applied to discussions on three themes: (i) entry points; (ii) cocreation (as "designing with"); (iii) motivations and incentives; and (iv) concrete examples. The emphasis on development reflects that transition from our prior knowledge and practices won't occur without effort.

1.1 What are the entry points to service systems from where they are?

Not all segments of societies and economies are equally impacted by the advanced technologies or globalization so that associated service systems need to be viewed differently. Comparatively, changes are generally perceived minimally in hospitality industries (e.g. hotels, restaurants) that emphasize "high-touch" service and social interaction occurs face-to-face. Moderate change is generally perceived in health services (e.g. medical care, hospitals) that centre on personal care, but rising costs surface opportunities for greater efficiencies (e.g. electronic patient records). Massive change is generally perceived in information-based businesses, such as media and entertainment (with digital downloads displacing physical distribution) and financial services (with monetary and non-monetary instruments changing hands around the globe, around the clock).

Entry points into changing service systems are associated with the nature of resources, and they ways in which tangibles and intangibles are negotiated, created and delivered. Institutions associated with industrial systems that benefit from economies of scale standardize outputs to for mass production and cost reduction in markets where demand exceeds supply. When supply exceeds demand, service systems rise as supplier introduce variety as a way of to capture customers and then gain financial returns based on economies of scope.

1.2 Which systems are better suited for "designing with" rather than "designing for"?

Service systems may be characterized by co-production with offerings (as either inputs or outputs) (Ramírez and Wallin 2000), and co-creation of value (i.e. (i) co-experience and co-definition, and (ii) co-elevation and co-development (Novani and Kijima, 2010)). However, more service systems that operate in a linear and sequential fashion may be characterized more simply as producer-product relations.

In software development, there is often a differentiation between (i) a waterfall method, in which specification are completely predefined before construction; and (ii) an iterative or "agile" method where users are engaged during the lifecycle so that unarticulated needs and preferences can be surfaced as the conceptual becomes more concrete. A waterfall method has analysts "designing for" their customers. An iterative or "agile" method has analysts and users "designing with" each other in mutual learning and shared outputs. Software engineering has a long history of practices developed with waterfall methods.

"Designing with" in interactions of co-creation has a premise of a shared body of knowledge, both in explicit artifacts and implicit mutual understanding. Service systems that operate towards co-producing outcomes and co-creating value require both services recipients and providers to shift their mindsets towards participation and involvement. These engagements generally involve shared benefits and shared risks, so that responsibility for outcomes is borne mutually.

1.3 What motivations or incentives encourage the shift to service systems from the legacy state?

Businesses can be compared to (i) bus lines that operate on a planned route, without regard as to whether passengers are or are not on the bus; and (ii) taxicabs that may be hailed by or dispatched to passengers, and require the specification of a destination before they can fulfill their function. The bus lines can be characterized as (i) *make-and-sell* organizations that produce outputs as a first step and worry about distribution and customers later; and taxicabs as (ii) *sense-and-respond* organizations that negotiate understandings of value, outcomes and outputs before or during operation of the system.

Make-and-sell organizations are most appropriate when maximal production efficiency is paramount, e.g. when resources and supplies are constrained so that finding customers is not an issue. Sense-and-respond organizations are most appropriate when values, outcomes and outputs are ambiguous or difficult to articulate.

Service systems are generally sense-and-respond organizations. An evolution from a society of the scarce to a society of the plenty would encourage the shift from industrial production to service systems.

Maybe evolution from a society of the scarce to a society of the plenty.

1.4 Do we know of concrete examples of the new service systems?

Service systems, when operating correctly, serve. Thus, communities centered around religion (e.g. Amish farms) and human well-being (e.g. medical hospitals) have a long legacy of service. The systems that could benefit by additional research and development have shorter histories, often associated with information and communication technologies, and globalization.

Thus, the electronic devices and media based on digital technologies that are ubitiquitous in today's advanced societies surface challenges in the design of new service systems. These businesses involve hardware platforms, application software and firmware, and service providers in complicated relationship networks. A mobile smartphone is now conventionally expected to be upgradeable with selections from application marketplaces as well with roaming partners as with the local provider.

In the music business, falling costs of content distribution over the Internet have restructured the relationship between musicians, producers and listeners. The rise of user-generated content (e.g. blogs, Facebook, YouTube, and Twitter) is a stark contrast from the broadcast and syndicated media of a decade ago.

The codevelopment of new-to-the-world innovations often has organizations operating as networks in joint enterprises. When collaboration requiring specialized expertise and resources crosses organizational boundaries, the roles and definition associated with service systems definitions can encourage productive order.

Education and development have become globalized, such as with the Global Learning Lab at the University of Queensland in cooperation with the UNESCO Man and Biosphere programme.

In general, an industrial orientation correlates with linear chains where coordination operates in pairwise links. Service systems are more complicated, often with three or more parties in interaction (e.g. a medical patient, the medical provider, and a third-party payer).

2. Education on service systems: How do we help others learn about service systems?

In the absence of commonly accepted textbooks and curriculum on service systems, pedagogy becomes a challenge. Dialogue included topics on (i) learning methods; (ii) the contribution of the systems sciences; and (ii) comparisons to current methods in education. Practically, educators will start from their existing bodies of knowledge and practices, with varying appreciations of the changing contexts in society and economies.

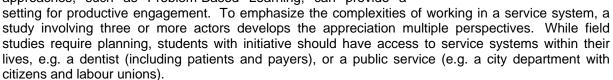
2.1 Through which processes will novices / beginners best learn about service systems?

Service systems often involve technologies, and always involve human beings. Individuals commonly have roles as customers or recipients from service providers, and thus gain a perspective when each

is an actor external to a service system. Co-producing a single outcome is, however, different from taking responsibility for co-producing or designing a service system that will operate effectively for multiple customers and/or service providers in cooperation. Becoming involved in the design of a service system drives the need for a deeper understanding of constituents and tradeoffs.

The practical appreciation of human practices is often gained through experience. While anthropologists are skilled at observing cultures at work, learners hands-on to a service system may have the option of assuming the identity of a service provider -- at least briefly -- or shadowing an experienced professional in his or her natural world. A phenomenological engagement includes prior expertise, proficiency with tools of the trade, and working styles with colleagues and customers.

In structured pedagogical methods, experience-oriented approaches, such as Problem-Based Learning, can provide a





2.2 How do the systems sciences help in learning about service systems?

The systems sciences provide a common language that can help bridge the many varied aspects of the world. Perspectives can include individual, organizational, technical, economic and political aspects. While the science of service systems is continuing to evolve, clarity in basic concepts (e.g. function, structure and process), models (e.g. living systems, inquiring systems) and methods (e.g. dialogue) provide a general body of knowledge that can be specialized as the discipline and subdisciplines become established.

The value of knowledge in the systems sciences after the domain of service systems has been well-established may diminish when conventional wisdom has been established, but the systems sciences can always provide a critical view that continues to sweep in new perspectives if the discipline becomes too inwardly-focused.

2.3 How is the approach to service systems different from prior approaches to education?

In systems thinking, synthesis precedes analysis, where (i) the whole in which the part is contained is identified, (ii) the behaviour or properties of the containing whole are explained, and (iii) the behaviour or properties of the part is explained in terms of its role or function in the containing whole (Ackoff 1981). Accordingly, a service system should be viewed not just reductively, but as part of a larger system. The service system is part of a larger world.

Following this systems perspective, learning should develop an appreciation of the functions or roles of a service system in the expanded contexts before taking them apart. This suggests that learning should emphasize synthesis before analysis. Both synthesis and analysis are important. Developing an intuitive appreciation of a service system in its containing whole should be prioritized earlier with continuing refinement and depth, rather than integration only as a final activity (e.g. in capstone projects or units). The relationships and interactions within the containing whole for a service system can be more complicated than those inside.

3. Models of service systems: How do we understand and describe service systems?

Models can range from the informal and implicit to the formal and rigorous. Models of service systems are represented from person to person as ways of conveying conceptual phenomena on negotiations.

designs and operations. Understanding and describing service systems raises questions about (i) the scope and purposes of modeling; (ii) transitions and alignment of models across a variety of disciplines or professions; and (iii) how these types of models might be different from others.

3.1 What should the model deal with? For what purposes to we model service systems?

While realists would philosophically argue that a service system can be objectively modeled, human involvement can lead to issues where one's perception becomes his or her reality. Thus, effective models of service systems need to appreciate that the breadth of a variety of perspectives -- as views, lenses or template -- may be as important as the depth of a single analysis.

The purpose of a modeling a service system varies according to context. Developing a new service system calls for models that reflect understandings of the needs and preferences of service cocreators and designers towards a converged concept. Practicalities of feasibility and viability lead to models in which service trade-offs are considered and resolved. A service system in operation may benefit by an abstract model through which improvements and extensions are envisioned.

3.2 How do we reconcile service systems across scientists, engineers and managers?

The variety of service systems models can include conceptual models, analysis models, design models, component models, implementation models and deployment models. Scientists are most interested in the nature of service systems, and how various types may be superior or inferior in the range of environments in which they are (or will be) found. Engineers are conventionally pragmatic in

composing and maintaining service systems that are reliable and robust. Managers are generally interested in ensuring the performance of service systems, with efficient use of resources to produce desired outcomes.

Across these disciplines / professions / orientations, models of service systems enable collaboration and discussions on the creation and adaptation of future designs, as well as on the effectiveness of current designs on meeting the needs of stakeholders.

3.3 In which ways are service system models different from other models of the world we've already created?

Service systems include both parts that are technology, and parts that are human. Attention should be paid to the boundaries defined in models of a service system. Breaking a system down into one independent model with only technology parts and then a subsequent independent model with only human parts reflects the disciplinary view of the observer, rather than the interactive nature in reality.



Complete service system models should include not only *outputs* in response to each situation or request, but also *outcomes* as perceived by the human participants, and the *value(s)* derived by each. While subjective aspects of service systems may be more difficult to order or quantify than objective aspects, their abstractness should not deny their reality.

4. Science of service systems: What do we know about service systems?

The science of service systems is current going through a revolution, as technology and changes in the nature of social interaction reflect a world in the 21st century. Principles, inferences and conventional wisdoms from the industrial age should be treated with suspicion. In outlining what we do (and don't) know, (i) the scope of the science of service systems will need to have been accepted; (ii) new features will have to have been acknowledged; and (iii) some sense of progress will have to have been perceived.

4.1 What is the scope of a science of service systems?

While the art of service is not being denied, establishing a science of service leads to replication and reproducibility. The emphasis on systems associated with a science of services provides a common language and foundation that will be taken for granted as knowledge in the domain matures.

The emphasis including human values into the science of service systems may be controversial to scientists based in a realist philosophy, but not controversial to scientists comfortable in constructivist and interpretivist philosophies.

4.2 Are service systems really new?

Studies of service systems are not all new. Services to human beings with industrial age technologies -- mechanical, chemical and electrical -- are already well understood. Digitalization and cheap Internet technologies enabling near-real-time communications and globalization have changed the feasibility of certain types of service systems more than others.

Service scientists can enrich the understanding of service(s) by contributing a perspective on the interacting parties/parts and/with human action and values.

4.3 How far are we on advancing a science of service systems?

Much of the knowledge on services is fragmented across a variety of disciplines. As examples, textbooks on service marketing, service design and service operations represent mostly independent bodies of knowledge without integration.

With the science of service systems proposed only circa 2005, the science is arguably in its childhood or adolescence. The systems sciences have a body of concepts that can be extended and applied with frameworks, models and methods in the domain of service(s).

5. Philosophy of service systems: Why do (or should) we care for service systems?

Although potentially esoteric to practitioners, sciences are associated with foundational philosophies. The functions of philosophy with service systems include (i) purpose; (ii) associated shifts with a changing world, and (iii) scope.

5.1 Why would we need a philosophy of service systems?

In the absence of a science of human practice, we may incorporate inductive, abductive and deductive approaches to appreciating, designing and constructing service systems (Ing 2009). We may know how to design and operate service systems, but the why, when and where may not be so necessarily taken for granted.

5.2 What shifts in philosophy might be associated with a service systems approach?

Service systems now operate in new levels of complexity in dealing with transnational societies, global businesses and new technologies that were only science fiction a few decades ago. Cultures need time to absorb those changes, and many people will experience friction as they maintain traditions and prior processes without a professional or as anadyrenisms out.



traditions and prior practices, either as preferences or as anachronisms out of step with the advances in civilization.

5.3 What is the scope of a philosophy of service systems?

The presumption that service systems should serve is sometimes lost. The aesthetics, morals and ethics of service systems are foundational questions that should continue to be explored and challenged.

6. Continuing inquiry

The conversation on a science of service systems at Pernegg in April 2010 provided the research team with a richness of contemplative time to advance our collective thinking. In July 2010, an overview of research interests and orientations was presented in a panel at the INCOSE International Workshop in Chicago, and a preliminary digest of the Pernegg conversation was outlined at ISSS Waterloo 2010. The learning on a science of service systems continues.

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Team 3: Learning Systems for Sustainability

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Conversation Topic:

Designing a meta-system as a vehicle for enabling dialogue and collaboration among diverse and geographically dispersed individuals and institutions with a shared identity around innovating learning systems for sustainability.

Summary:

Our team worked on design issues at the intersection of learning, systems, and sustainability. We explored the urgent implications of sustainability as a framework for addressing the complexity and interconnectedness of global and regional challenges such a climate change, water shortage, energy supply, resources availability, and so on. At the core of such sustainability challenges are questions related to the way human and human activity systems live, learn and interact with their environment.





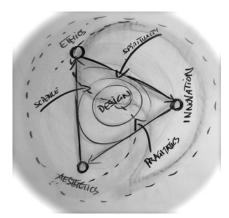
The scaffolding we created for a meta-system of *pro-active co-adaptation* (i.e., sustainability) of people with planet considered the dynamic interplay of ethics, aesthetics, and innovation in a learning and design context informed by science, spirituality, and pragmatics. Design was understood to be a product of *self-organizing action inquiry* (i.e., learning), and as such, is entirely emergent and ever evolving. By basing our design approach on systemic action inquiry we underscored the fact it is not possible – or desirable – to know what the result of the design will be at the beginning of the process. Freedom of the definition

of outcome is essential.

This insight made clear that whatever we were to name our meta-



system model, it would have to be about process, pattern and relationship rather than about product, outcome or object. We spent much time considering appropriate metaphors, but in the end chose to hold the naming playfully, to focus on the content of the model, and to let the name for it emerge.



The three main components of our meta-system for pro-active co-adaptation through self-organizing action inquiry are:

- 1. A "think tank" function that integrates two horizontal learning cycles; one based on selforganizing systemic action inquiry, and the other on the ontology of dynamic sustainability.
- 2. A "link tank" function that operationalizes the model through the design of a socio-technical system capable of capturing the emerging pattern language of successful pro-active co-adaptation for global systemic sustainability, and of structuring the emerging design insights into usable outcomes, such as a field guide on how socio-ecological challenges are resolved.
- 3. A "do tank" function that coordinates the action research initiatives of the various geographically dispersed participants, each engaging in their own systemic learning projects on issues of sustainability.

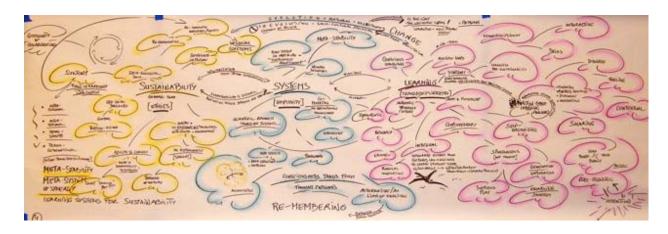
The operational cohesion of the link-tank serves to integrate the approaches developed in the individual projects of the do-tank in an emerging pattern language of sustainability captured in the think-tank. This pattern language is then fed back to the do-tank to inform and align them with each other as well as with the ever changing needs of global sustainability.

The professional graphic representations in this report were created by Regina Rowland unless otherwise noted.

Learning Systems for Sustainability (Detailed report of Team 3)

Sustainability has become a major topic within universities and institutions involved in development initiatives. Sustainability recognizes the complexity and interconnectedness of global and regional challenges such a climate change, water shortage, energy supply, resources availability, and so on. At the core of sustainability challenges are questions related to the way human and human activity systems live, learn and interact with their environment. This team will focus on two objectives:

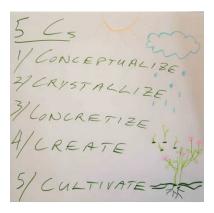
- identifying the systemic principles relevant to formal and informal programs focused on sustainability (both educational (e.g., degree programs and community workshops/trainings), and entrepreneurial (e.g., social businesses and cause-driven ventures));
- designing a meta-organization (e.g., a consortium) as a vehicle for enabling dialogue and collaboration among diverse and geographically dispersed individuals and institutions with a shared identity around innovating learning systems for sustainability.



General reflections

- Combining emerging themes
 - Our team: Learning Systems for Sustainability
 - Ockie's team: Creating Systems Education Curricula

- o One of our main objectives: emerging a meta-system of sustainability initiatives
- Attending to our individual needs: intra-personal syntony
- Moving our process through the 5+ Cs −
 - Conceptualize
 - o Crystallize
 - o Concretize
 - calculate
 - the 7 questions of investigative journalism
 - who?
 - what?
 - when?
 - where?
 - why?
 - how?
 - how much?
 - Commit
 - coordinate
 - Create
 - Cultivate



World Café Conversation rounds focused on the ideal outcomes from this week —

(The World Café is a soft technology of social interaction developed by Juanita Brown and David Isaacs to help groups focus on "conversations that matter." For more on the World Café, follow this link "http://www.theworldcafecommunity.org/")

World Café Conversation Team 1:

- a spiral of integration
- o create the first node with the Creating Systems Education Curricula group
- ⊙ looking for a human and interpersonally significant set of relationships based on the 5+ Cs
- starting with some actionable set of objectives that each of us could go home with and follow up on
- o creating nodes that are action spaces that invite deep dives
 - o using the 5+ Cs
 - o resources, actors,
 - o CATWOE
 - containers and categories that help provides the scaffolding for an action plan

World Café Conversation Team 2:

- coming up with a meta-meshwork thing
 - creating a common vision for that
 - a systemic action research piece
 - a project based action

- a pattern language for sustainability (Christopher Alexander)
- open university idea
- particular existing projects that lend themselves to this stuff
 - ELI
 - BTI
 - etc.
- prioritize what we do
- get a name → identity
- commitment to the vision
- an action plan

World Café Conversation Team 3:

- starting from what we heard about designing meta-systems for learning for sustainability
- connecting what is already here
 - not just reinventing efforts
- not much time to build all this
 - it needs a lot of energy
- putting together a list of activities/actions in this special field
 - o the ones that will have the most probably effect
 - with the least require effort or input
- thinking of this as performing systemic acupuncture
 - where are the hubs that can be best activated
 - o touching the sensible points which will put into motion dynamics within the societal body healthy evolutionary processes
 - this involves knowing the what are the sensible points
 - feeling of identity in a nation
 - economy,
 - etc.
 - the chakra points of the spiritual
 - the points that keep the society together
 - the points that draw society apart
 - key learnings emerging from our conversation so far...
 - o team teaching with different perspectives
 - o self organizing learning as an essential tool for learning environments for adults
 - o multidimensional spaces with appropriate architecture, cognitive emotional spiritual
 - the freedom of the definition of the outcome is essential
 - at the beginning, you cannot know what the result will be
 - powerful learning is action based

From conceptualizing to crystallizing - a creative conversation

Victoria:

- We need a true purpose
- We need to take this conversation to another level
 - o or else it will be a waste of time
 - o it needs to be a conversation that brings us to a place where we are really cocreating
- We need to seek to do this in a more profound way

Stefan:

- We are in an uncomfortable zone now and that means we are on track!
- Each of us may have some projects in our mind in our backpacks and we are trying to get them into the common project that we are 'projecting' here on our diagrams.
 - o I am particularly interested in the Link Tank
 - we could really connect and bring into play so many things

Kathia:

- I am really attracted to the process that is emerging in the diagrams we are creating
 - the emergent aspect of creating a purpose that is based on a dynamic of certain components that, when brought into interaction in a certain way, emerge directionality

Thomas:

- \odot here is a process we can use for how to go on
 - o we have to get into the hands on work
 - taking the two models, explaining what are the research areas, explaining what is in there, defining our actions
 - understanding our boundaries, seeing the points of our purpose and



our values, and then bringing them down to specific points of costs, material, and other details.

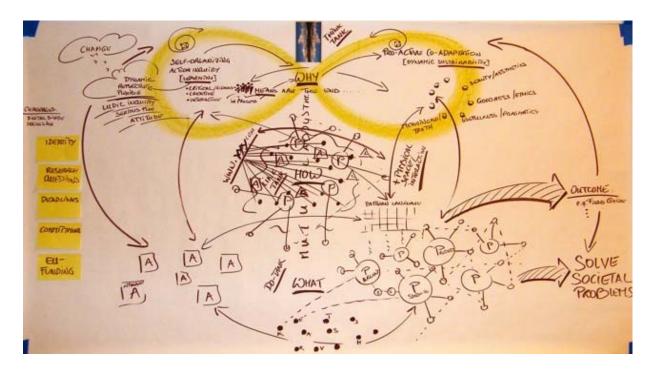
- moving from ideals/ideas to concrete working model
- o what science fields are involved, what spirituality, etc.

Emerging Questions:

- 1. What need is this model/project addressing?
 - a. What for?
 - i. why?
 - b. Target area?
 - c. Who?
 - d. What values and reasons hold us together?
- 2. How can this be made operationally viable?
 - a. the technological aspects
- 3. What are the actions within the projects that reach the purpose (Question 1 in this list)?
 - a. the emergent pattern language of this project
 - i. What is the structural coupling required of a concrete case for it to adapt to this project and for the project to be relevant to such a case
 - 1. for example, Enrique's doctoral program in Argentina
 - 2. what are the patterns here that relate to Question 2 in this list?

Mapping the model

re-cast the emerging model as a 'three layer cake'



Victoria:

- Regarding the Why of this project, we can think of it in terms of *pro-active co-adaptation*
 - o learning is the most important way of achieving this
 - self-organizing action inquiry
- The means are the ends as Gandhi observed
 - $\circ\quad$ exactly what we would like to engage in is what we would like to see in the broader world around us
- Enrique expressed that we should not hold this process as The Right Process
 - o it implies a lot of networked learning processes
 - this expresses a ludic inquiry (from the Latin ludere meaning "to play", as in Hermann Hesse's Magister Ludi)
 - it involves embracing change as the central constant
- ⊙ The learning process, in order to produce attitudes that are future creating, must be
 - o critical thinking
 - o creative thinking
- \odot The outcome of the learning will address the framework of characteristics that are the very system we seek to evolve
 - o beauty
 - o truth
 - usefulness
 - o goodness
- How to learn in the way of re-evaluation process

Johannes:

- There are many projects
 - o actions happen
 - they are fed by learning that happens
 - they all serve the purpose of the meta-system
 - o common approaches
 - feed the common purpose

- Actions of the projects facilitate the learning and speed up and improve the process
- At the meta-system level, we have the collaborative space
 - o we have a variety of individual projects that each of us are working on
 - but people wouldn't know of the potential synergy between them
 - so individuals from each project meet at the meta-system level to coordinate their activities
 - o a common project
 - different organizations collaborate on them for synergy
- Suggestions for common activities
 - o sharing on a regular basis (e.g. monthly) by Internet conferences projects, project approaches and receiving constructive feedback and suggestions.
 - o meeting on a yearly basis for an in-depth exchange, a "meta" project evaluation, the further development of the pattern language and community development
 - o Sharing project ideas, projects and experience a "platform"
 - o involving each other actively in project activities for an in-depth exchange and trust
 - o building an "expert" pool to resolve challenges of design better and faster
 - o putting together a common draft of principles/patterns/approaches out of existing field books, concepts, tool boxes ... and refine it for use as our "common" language.

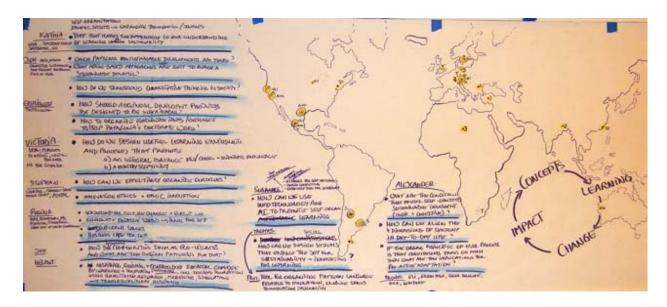
Stefan:

- The focus was all about enabling technologies
 - o creating the "link tank"
 - the virtual space
 - the real world spaces
 - linking individuals with their real world engagements
 - \circ $\,$ with the persons, you will link the contexts of the persons
- Because learning processes are dynamic processes, there must be an interactive aspect of the relationship
 - web space
 - one web address
 - o this is one enabling space
- The virtual space must support the real world spaces
 - o tools for integrating feedback
 - o tools for linking and learning
 - o tools for connecting people, projects and needs
- We will need to insure the interactivity
 - o creates the dynamic
- Accessibility issues
 - o digital divide issues
 - there are approx. 60% of humans who do not have access to this
 - younger people might be quicker than those with more life experience
 - o inclusion issues
 - how open should the infrastructure be designed to be?
 - should everyone be able to see and act on everything in the virtual space?
- We will need laboratories and hubs
 - o both virtual
 - and social nodes
 - regular meetings and events
- This is a big project
 - o start with static site
 - experiment, explore, and expand

Group decision:

- we work on a proposal a generic proposal that would serve as a template from whatever grant then we find
 - o from project perspective
 - o from technical perspective
 - o from generic systems perspective
- we could also just do it!

Defining the players and the playground



Now that we have identified the geographic centers of our research activities, we can focus on answering the following three questions –

- 1. Research Questions
- 2. Roles
- 3. Commitments

Kathia:

- Research Questions: What's the difference that makes the difference in our understanding of learning for sustainability?
- ⊙ Type of projects: Looking at sustainability in a dynamic way and expanding the boundary of what we mean by sustainability so that it is more inclusive and is a journey that keeps alive a process of self-organization toward greater syntony.

Johannes:

- Questions: What are the patterns of sustainable development? What action-based approaches work best to reach sustainable dynamics? How does our whole society work − how can we start changing the penchant toward quantitative thinking? How do successful communities − such as eco-villages − work, and what are the design patterns for them?
- Projects: small entrepreneurial projects that seek to use these patterns, in Europe,
 Asia and Africa, and now also in Mexico.

Enrique:

Questions: How should regional development projects be designed to be sustainable?
How can we organize the worldwide exchange of ideas to help Patagonia's doctoral work?
Projects: the doctoral program of Patagonia in Argentina.

Victoria:

- Question: How do we design useful learning environments and processes that promote –
 - o an integral balance between consciousness and scientific knowledge
 - o a healthy skepticism
- Projects: UMA in general, and in particular, MA degrees in architecture, law and business. Also high school related to learning for sustainability.

Stefan:

- Questions: How can we effectively organize ourselves? How can we work together without loosing our individual identities? Under which identity will we not loose our individual identities? Ph.D. research question is about pattern language of emerging business knowledge refocused to aesthetics, ethics, and innovation (focused on the field of design).
- Projects: Change the Game initiative, centralized in Austria with service all over the world. Almtal that is involved in regional development processes in a valley in Austria (the one where Conrad Lorenz imprinted), using a design process.

Regina:

- Questions: What are the developmental stages that lead toward sustainability? What is the business case for sustainability? How can we create the environment and the mental state for innovation? What is the leadership for culture change?
- Projects: Blekinge Institute of Technology (BTH) in Sweden, Meredith College on the East Coast of the USA, Fielding Graduate Institute in California, Marylhurst University in Portland and Portland State University, and in Austria with a few others institutes.

Alex&er:

- Questions: What are the conditions that foster self-directed sustainable development? How can we align the four dimensions of Syntony in day-to-day life? If the organizing principle of evolutionary process is that *consciousness takes on form*, then what are the implications for pro-active co-adaptation?
- O Projects: ELI, Green MBA, Organization Development, UMA, Waldorf

Hellmut:

- Questions: How can we engage in using, guiding, and controlling societal change?
 - through learning and innovation
 - including societal innovation
 - o using qualitative research
 - o modeling and simulation
 - → transdisciplinary research
- Projects: Research in shamanism in Siberia and elsewhere

Susana:

- Questions: How can we use Information Technology and Artificial Intelligence to promote self-organized learning?
- Projects: Human-computer interaction models for self-organized learning. Mobile computing to support post-graduate training related to sustainability. Ontology development for sustainability.

Thomas:

- Questions: related to Kathia's, Johannes', Stefan's research questions. Mine would be if you see experience as joy for sustainability, how can we design systems that foster this experience?
 - o through lucid engagements that enable such an experience

- joy for learning
- Projects: Developing a tool for organizing pattern language. Consulting projects related to innovation. Projects related to creating enabling spaces. Cooperation with the main press agency here in Austria related to R&D on education, innovation, and art.

RefleAction Research Question

What would you share with this group in terms of valuable experiences related to learning systems for substantiality?

<u>Self as Project</u>: What are the new ways of being and becoming that bring us into relationships of sustainability?

- Oconcepts: What is the pattern language that we are seeing and how can we summarize that?
- Ochange: What are the new/emergent values/characteristics/attributes that we are seeking to foster?
- Learning: How can we design innovative learning environments and processes?
- Impact: What are the impacts/results/outcomes that this meta-system can bring about?



Metaphors for the emerging project

- Mirror
- Clear Path
- A Road to Somewhere
- Indefinite Destination
- Steps in the Right Direction
- Unity in Diversity
- A Clean Environment
- Totem Pole
- Connecting Sky and Earth
- Ballooning
- Reflections of possibility
- Memories of things yet to come
- Nesting potentials
- Fostering futures
- Protection of the fragile
- Potential and human potential
- Social architecture
- Sea of Potential
- Light in the Dark
- Guidance System
 - ■Evolutionary Guidance System
- Stewardship
- Change the Game
- ⊙ The Pernegg Bridge
- Bridging and connecting
- Beach perspectives
- ⊙ The Innertube/Lifesaver
- The pool



- The party
- The toolset

Additional Brainstorm/Heartspeak ideas, images, references:

holding – releasing – connecting evolve your world change of heart learnovation

ELPACAS – Evolutionary Learning for Pro-Active Co-Adaptive Sustainability

GlassBeads

Lovecats

Nexteps and commitments

- Stewards for each action-research team
 - 1. Concepts
 - i. Johannes
 - 2. Change
 - i. Kathia
 - 3. Learning
 - i. Victoria
 - 4. Impact
 - i. Stefan
 - 5. Self as project:
 - i. Alex&er
- Stewards meet once a month on Tuesdays via Skype or GoToMeeting (w/Johannes)
 - o 10am SF
 - o 12pm Mexico
 - o 2pm Argentina
 - o 7pm Europe
- The 1-4 Stewards collaborate in conversations through Ning
 - o emergent outcomes will result from this
- The 5th Steward coordinates the conversations and prepares the report from work at Pernegg
- Enrique will be involved with capturing the areas of the 1-4 being stewarded
 - $\circ\quad$ will seek to represent the systemic relations of our action-research questions in a non-linear form
 - → concepts → learning → change → impact ←

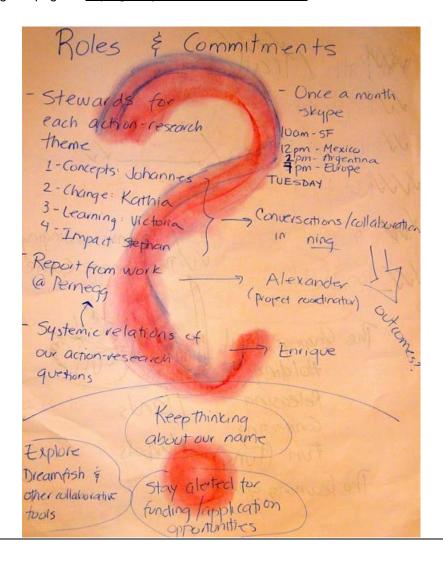
In General ...

- Keep Thinking about our name
- Explore Dreamfish + other collaborative tools
- Stay alert for funding/application opportunities

This Final Report from the 2010 IFSR Pernegg Conversation Team N^o 3 on *Learning Systems for Sustainability* is a synopsis of a much larger, more comprehensive research report generated by this team.

As it is traditional in Pernegg, team members may also submit individual opinions in separate short papers.

In order to obtain the full 57 page report, please send your request to alexander@syntonyquest.org. Additionally, the images embedded in this document are available for download at higher resolution from the following webpage — http://gallery.me.com/thelasz#100235



Discussion Paper (Team 3)

A Sense of Syntony: The Evolutionary Aesthetics of Consciousness-driven Emergence

Alexander Laszlo

Learning systems for sustainability is a pandragogical orientation serving to open a path of being and becoming that liberates the full potential of conscious evolution. It is easy to make change happen in the world. What takes more presence of mind, heart and spirit is flowing change so that what you do is both a natural, seemingly inevitable outcome of evolutionary dynamics and, at the same time, an expression of your deepest dream and highest vision for what should happen next. My interest in Team 3 of the Pernegg Conversation 2010 is to explore the relevant axiological and dispositional orientations involving insights, practices, principles and lived experiences that can inform the challenge of embodying, incorporating and enacting flowing change in learning systems of all kinds (both formal and informal as well as both academic and entrepreneurial).

To begin with, my research explores the question of how we start down the systemic learning path of evolutionary leadership. The design questions for individual and collective learning systems for sustainability include:

- O How do we align ourselves on that path, and where do we begin?
- In what way can we take the first steps so that we avoid trudging doggedly down well worn ruts of habit and reflex and instead are danced along flights of creative inspiration?

All of us have had the experience of being in moments of flow, of true alignment and dynamic harmony with an evolving pattern of being and becoming, and in these moments it seems almost as if we are borne along by unseen currents of creative emergence. That is the experience of syntony as an organizing force in evolutionary dynamics. My interest in this conversation team is to explore how to harness the power of that force through conscious intention and heightened attention.

For learning systems to embody the conscious creation of conditions for sustainability that give rise to syntonious patterns of being and becoming, it is important for them to be designed to cultivate an evolutionary sense-ability. The ability to sense patterns that foster creative emergence places greater importance on process over product. If we get the being and becoming of our life right, the living of it will be a natural by-product. Taking on the mantle of Evolutionary Leader therefore involves listening, learning, sensing, feeling and ultimately knowing the "rightness" or "trueness" of a developmental path that has heart. It is a whole-being engagement, not one involving the intellect alone. In fact, it requires us to think with more than just ourselves!

Conscious evolution through evolutionary leadership draws on our interconnection with the world around us, feeding and being fed by the flowing patterns of creative emergence. Fostering the ability first to perceive these patterns, and then to cultivate them, is the first challenge of the evolutionary leader. Becoming skilled at flowing the patterns into a vibrant and pulsing existence all around us is the challenge of syntony. The design objective of learning systems for sustainability is to explore the essential parameters of this challenge, to model the ideal systemic relationship that can foster it, and to plan how to move through the stages of conceptualization, crystallization, concretization, creation and creation that will take such a model into operational viability. This is the research interest and focus with which I come to the Pernegg 2010 Conversation Event.

Discussion Paper (Team 3)

Two Types Of Questions

Enrique G. Herrscher

The German poet and thinker Hermann Hesse told us, in his wonderful tale "The Journey to the East"⁶, that in our projects and enthusiasms we usually have a *general* aim (improve something, help others, save the world, etc.) and also a *personal* interest (in the case of Hesse's protagonist, to see Princess Fatme with his own eyes).

So it may be with Team 3. In my case, the general aim is to learn from others, to remember what has been said about our theme in previous Fuschl conversations and other occasions or places, and to advance as much as possible in our assigned subject "LEARNING SYSTEMS FOR SUSTAINABILITY", incorporating many different views from my team colleagues.

For instance, we may start reflecting about the two parts of our theme, "learning systems" and "sustainability", and then focus on the relation between both (including the different ways this relation could be understood) as well as its problematique. This is the approach of PART I of this input paper.

PARTI

As first part of my Input Paper, I venture to put forward the following 12 questions (all very much interrelated), under the premise that the initial inputs to Fuschl conversations may be *questions* rather than answers. To some extent I am following the structure of Hellmut's summary. Some of the questions may be more relevant to Latin America (where I live), others may be more general. As opposed to the (most necessary) advancements of theory, most questions are practical-oriented, put forward by a practitioner.

Question Nr. 1. Are we speaking of *LEARNING* SYSTEMS or of LEARNING *SYSTEMS*? In the first case, the focus is on Learning, and we start by stating that it is a System, and that it should be seen and studied as such. This is the approach by Bela H. Banathy's seminal work "*Developing a systems view of education*", recently translated to Spanish and published by GESI⁷. In the second case, the focus is on Systems, specifically how it should be learned, i.e. taught. It is my understanding that this is the approach proposed by Alexander and Kathia Laszlo, leaders of Team 3. Our first task should be to confirm (or modify) this interpretation, or to dwell (separately) on both approaches (obviously closely related).

Question Nr. 2. Our second task should be (and I hope I'm not becoming too formalistic) to interpret "for sustainability". Does it mean that the object of study is THE LEARNING (and teaching) OF SUSTAINABILITY? Or that THE LEARNING (and teaching) ITSELF SHOULD BE SUSTAINABLE? The first case is, I believe, what Helmut means by "learning systems should successfully teach how to plan, to design and to act sustainably". The second case is, I believe, what Alexander means by "identifying the systemic principles relevant to formal and informal programs focused on sustainability". Perhaps we should cover both, but separating clearly the two purposes.

Question Nr. 3. What would be the basis of NETWORKING WITH INTERNATIONAL ORGANIZATIONS, such as UN, UNESCO or diverse NGOs? What would we "give" them? What would they "give" us? Who are "we"?

Question Nr. 4. How would we handle the INTERCONNECTEDNESS OF GLOBAL AND REGIONAL CHALLENGES? To what extent should systemic principles on Learning/Teaching be universal, across borders, and to what extent should regional characteristics prevail? Who decides?

⁶ Hesse, H. *Die Morgenlandfahrt*, Fretz und Wasmuth, Zürich 1932

⁷ Grupo de Estudio de Sistemas Integrados, formerly Asociación Argentina de Teoría General de Sistemas y Cibernética, created by Charles François in Buenos Aires in 1973, and since then actively promoting the systems approach in Argentina.

Question Nr. 5. How would a META ORGANIZATION dedicated to these issues be created? Based on what kind of representation? How would be its governance? It's funding? Where would it be situated?

Question Nr. 6. To what extent should Learning (Teaching) be SELF ORGANIZING? What would be the obstacles? How could they be overcome?

Question Nr. 7. How do we cope with CHANGE? This refers both to changes in the society the Learning System is supposed to serve, and to changes in the Learning System itself. Formal education has not a good record regarding change.8 How can we change this?

Question Nr. 8. The vicious circle "POOR RESOURCES - POOR PERFORMANCE - POOR RESOURCES" is customary to many organizations, and is typical of many formal education systems in Latin America. How can we cut this loop? Where should we start?

Question Nr. 9. How can we reach FAMILIES that are not willing or not able to take their part in the Learning/Teaching process? Particularly when the family tradition itself is in crisis and, on top of all, its social support, the middle classes, are impoverishing in many places?

Question Nr. 10. WHO TRAINS THE TRAINERS (AND HOW)? This seems to be the key question9. Note particularly that – at least in most developing countries – any teachers still consider their task to be exclusively to transfer knowledge, not (also) to help creating values¹⁰.

Question Nr. 11. A traditional conflict area in formal education in Latin America is: "PUBLIC OR PRIVATE?". One way or another, someone must pay. Is this a "small is beautiful" versus "no exclusion" dilemma? Or has it to do with Peter Drucker's "more important than do things right is to do the right things", depending on the purposes of education?

Question Nr. 12. Finally, a question that may comprise all other questions: what is QUALITY in the Learning/Teaching process? Does Quality equal Sustainability (as Robert Pirsig¹¹ would say)? Has it to do with the purposes of said process? With the pay, training, motivation, selection or status of teachers? With the availability and ability in the utilization of new technologies? With the political, cultural and socio-economic context? Or with all above? Can we study it for all levels o level by level? How do we measure it? How do we improve it? What if it is excellent, but excludes a great part of the population?

PART II

As to my particular points of interest - always subordinated to the general aim - in this case they would not refer to meeting Princess Fatme, but to the following four areas, so as to learn from and share with those who may want to be involved, either within or outside the regular meetings.

(1)

The new president of ALAS¹², Ricardo Barrera, now also Dean of the Faculty of Economic Sciences at the Universidad Nacional de la Patagonia San Juan Bosco, has asked me to assist with the design of a Doctoral program for said Faculty. This endeavor may be a sort of casuistic practicum of application of a learning system for sustainability to a specific case.

⁸ The story goes round that if any professional from 200 years ago would visit us today, s/he would not recognize present work – except teachers. Alvin Toffler views present education as training some primitive people to survive at the border of a river - without realizing that a dam is being built upstream and that the river will not be there any more (conference in Córdoba, Argentina, some years ago).

⁹GESI interviewed a former Minister of Educations and is trying to do the same with the present one, with the purpose of introducing Systems Thinking in the curricula of teacher's and professors' training.

¹⁰ This has been for many years one of the main messages of Charles François, to the extent that in many of his publications he states that what we call education is really only instruction.

11 Pirsig R. M. Zen and the Art of Motorcycle Maintenance (1974, 28th. printing 1982), Bantam, New York, the

most profound book on Quality I know.

12 Latin American Association of Systemics, created in Lima, Peru, in 1992 and activated at the ISSS meeting in

Cancún, Mexico, in 2005.

The ideas for such program should answer the seven classical questions: what? why? what for? for whom? where? (in southern Argentine Patagonia), when? (as from 2012), how? (processes, steps, milestones, chronogram), how much? (tentative budget). And, as a result, the further *question*: what will make this program sustainable in time and space?

(2)

Since many years, I teach personal, social, corporate and especially entrepreneurial planning at several universities in the interior of Argentina and other LA countries. Theoretical, conceptual and practical aspects are all taught from a systems viewpoint (my textbook for the course is called "Systemic Planning – a strategic approach in turbulent times", 2008, now complemented by "Administration: Think and Act", 2009, both in Spanish, Granica, Buenos Aires). Mainly Ackoff's, Gharajedaghi's and Schwaninger's ideas of the application of systemics to organizations are followed, with special emphasis on *ethical considerations* (ecological-, social- and human-friendly ways of doing business) and on viewing *companies as part of society* (as opposed to the take-over, competition-aversion and unlimited growth trend of many big corporations).

How can this approach be generalized? Many colleagues, at least in Latin America, still teach business administration on a solely corporate profit maximization basis. Profit is certainly essential for individual units' sustainability, but is not enough, as unique guiding principle, for the sustainability of society, the context in which all those individual units operate. Some questions when addressing this sustainability issue:

<u>Question A</u>: Could we launch a program to promote a more integrated and society-friendly orientation for the teaching of business at graduate and undergraduate levels, where future entrepreneurs and corporate leaders are formed?

<u>Question B</u>: Should this endeavor be context-free or regionalized, for instance geared towards particularities of a certain region such as Latin America?

Question C: Can we support ontologically and epistemologically the shift in learning-teaching from "sustainability of business" to "sustainability of society"? Or should we say: "from viability of business" to: "sustainability of business"? In this way, the learning systems in this area of knowledge may come closer to provide solutions to the catastrophic situations of poverty, exclusion and inequality in Latin America.

Question D: What would be the tools, processes, steps and specific actions toward this end? For starters, I would venture to state – again using the "7 questions approach" (i.e. what-why-when-etc.) of the preceding section (1) above – that we may be concentrating too much on "how to" and too little on "why", "what for" and "for whom".

<u>Question E</u>: On the other hand – or perhaps on the same hand – are some universities too self-centered, an end in itself instead of a means for the improvement of society at large (also, particularly, of its local community)? Certainly, a university should be – as so well Robert Pirsig¹³ puts it – a "temple of reason". Our students expect, in addition to this wisdom (or instead of it), a training of excellence for their career, profession or scientific track. However – especially in public universities – students are not the only beneficiaries of the academic activity: much of it should address the solution or at least the understanding of social problems. Not only through specific projects in research or extension, but also in each end every MBA course.

Question F: The question arises: to what extent should the university determine what is to be researched or promoted at the community, or whether this should be left to the exclusive decision of each researcher or teacher? My opinion is that nothing, no theme or approach, should be forbidden to be explored, but that the universities should favor with special support and funding those projects most relevant to society. In the case of MBAs, this means particularly – from a very practical viewpoint – those related to values and critical thinking.

¹³ Pirsig, R. M. Zen and the Art of Motorcycle Maintenance, 1974, Bantam, New York.. See Note 6.

(3)

Some members of GESI, the Argentine group of systems studies, recently participated in the 5th International Congress of Complexity in La Habana, Cuba. We realized that, parallel to the "systems community", a very active "complexity community" had developed, particularly in Latin America, influenced mostly by Edgar Morin's books and personal activities.

It is my belief - and so I expressed it in a personal dialogue with Pedro Sotolongo, founder of the "Complexity" course at the Cuban Institute of Philosophy and creator of these biannual congresses that both approaches are almost identical, differing at the most in the (graphic) direction of the outlook: in one case, a way of looking at a complex world of systems; in the other, focusing on a world of complexity being looked at. The same complex world and the same systemic look. However, both approaches developed side by side, each with its own institutions, its specific bibliography, its geographical scope (systemics more world-wide, complexity more Latin America-oriented) and its different "age" (systemics with more than a half century wisdom, complexity with the force of a younger generation)¹⁴

Is this a matter of sustainability? I believe it is, for the systems movement in general, and therefore also for the learning systems in particular. If we do not communicate, network, learn from each other, even with the diverse organizations maintaining their identity and their history, chances are that the systems movement may become "the older version" and decline, as so often happens with institutions that thrive on past glory. Not everybody will agree - variety being one of our valuable assets - but I think this issue may well be worth a "Banathian" conversation, either here or in a future occasion.

Finally, a further motive drives me, but it is not specific for Team 3. Last year we launched in Argentine Patagonia the idea of replicating the Fuschl initiative, with a Latin American orientation, as from 2011, in Ushuaia (the southernmost city of the world), by a biannual "Conversation at the extreme South" It is to be organized by ALAS (see note 2) and CESDES¹⁵, with the intellectual support of IFSR.

From my Fuschl experience of two years ago (2008) and now from this one, I hope to help organize this replica, following Bela Banathy's philosophy and the rich Fuschl tradition. I will be thankful for any advice - probably during breaks - from those who organized past Fuschl Conversations. In some sense, this geographical spread of the Fuschl idea is also a matter of sustainability, if not of learning systems, of the overall mission of IFSR.

¹⁴ Len Troncale calls this field of complex systems "the 3rd generation". He states (in "Revisited: The Future of General Systems Research: Update on Obstacles, Potentials, Case Studies", Systems Research and Behavioral Science, Vol. 26 Nr.5, Sept. Oct. 2009, page 554) "This very active field continues to strive and has been more successful at attracting younger workers and serious funding than GTS"

15 Patagonic Center for Systemic Strategies of Development, a unit of the University mentioned in part I above

Discussion Paper (Team	Risks and Opportunities of Learning for Sustainability
3)	Victoria Haro

My present research interest and focus regards a reflection on the risks and opportunities that the actual ecology of learning for sustainability presents for the design of learning systems that *enable the human species to create a peaceful, abundant future in conscious interdependence and evolution with the rest of nature, and where human creativity and love capacity is maximized.*

Four important interconnected risks seem to be present in the actual learning context for sustainability (to which I will refer loosely as the "environmental context"), these are: superficiality, fanaticism, fear, and disregard or undervaluation of the human species.

• Superficiality: The emergence of a future like the one described above requires deep transformations of values, institutions and systems (transformation of the why, how, and for what). This requires a good overall level of understanding of the problems and opportunities we face, which in turn requires a culture of deep inquiry and reflection. False consciousness is dangerous, since it does not get the job done, and worse: it obstructs the way by appearing as deep understanding, so that further inquiry and reflection is prevented. The risk of superficiality – what many times is referred to as "New Age"— is often underestimated. New Age is a pervasive culture that has occupied an enormous space in Western culture in general and the environmental context in particular. Communicating profound understanding in a way that differentiates it from New Age is not a trivial task, since New Age has effectively appropriated and turned vacuous a wide range of serious inquiries –from quantum physics to meditation.

The challenge is not only in communicating profound knowledge, but more importantly, in generating it. At the individual level, as Peter Senge proposes, this requires brilliant intuitions that may be converted into succinct, rationally testable propositions ¹⁶. To generate profound understanding, these rational propositions must then be collectively distilled through scientific process. Several theories and practices have been developed to enhance the emergence of brilliant intuitions and their corresponding translation into propositions. In particular, the perspectives of Integral Theory, Systems Thinking, Reflective Dialogue and Theory U have shed important new light into designing learning systems that attain this, both through individual and collective processes. These perspectives have begun to gain attention and interest in the environmental context. However, it seems that the perception of the role of scientific process as a profound distillation practice could be strengthened. The power of the scientific approach as an antidote for superficiality has been undermined by the extended cultural view that this is the business only of scientists -but the principles of rational argumentation and the invocation of evidence improve *any* discussion, regardless of the level of expertise at which it is conducted (including no expertise at all). Thus, 'citizenizing' this approach seems a key ingredient in offsetting New Age culture.

Indeed, there is no clear way to identify if our knowledge/ experience/consciousness on a subject is superficial except by submitting it to continuous and vigorous testing through individual and collaborative inquiry as well as evidence gathering. This scientific process entails some helpful features which are often misunderstood in regards to their role in the emergence of profound knowledge. For example, this process implies a *skeptical attitude* whereby all knowledge is held as a hypothesis (not immovable truth) that may be overthrown at any time by new evidence or a better hypothesis. This motivates continuous creativity in searching "out of the box" alternative explanations to phenomena –thereby also continuously fine-tuning initial hypothesis as well as the understanding of what we searched to explain.

On the other hand, evidence is not necessarily technical data that can only be gathered by specialists, but also encompasses experience and information gathered through 'simple' (i.e. not expert) ways. What matters is the force that the evidence offered has for sustaining a *general* proposition. This fine-tunes our systemic understanding of the relationships between phenomena. But more importantly, it inhibits the declaration of unfounded (or not carefully thought) propositions. In any case, all evidence may be challenged, since evidence-gathering itself is an important object of inquiry. This motivates a

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¹⁶ Senge, Peter M.; The Fifth Discipline, New York: Doubleday, 1990, p.158

constant attention and improvement of evidence-gathering processes, polishing our tools for identifying possible sources of error.

Finally, scientific thinking is sometimes perceived as opposed to intuitive or experiential processes; but this is not so: as implied in the above referred view of Peter Senge, intuitions, perceptions and experiences are *crucial creative inputs* in the scientific process. We could say that an integral training in this process would enhance both our capacity for brilliant intuitions and our capacity for traducing them in succinct, testable, rational propositions.

An integral scientific process would also develop our dialogue abilities and procedures, since a true scientific approach welcomes diversity; and intolerance to diversity is the chief barrier for dialogue. Indeed, the very essence of the scientific approach is to *promote* different and even opposed views, for otherwise skepticism and error-detection cease. The type of dialogue that this approach enables is the very engine of why it acts as an antidote for superficial knowledge, since it implies that no recourse to the faith of an established dogma is accepted as valid, skeptics are always welcome, and no argument is held to be above the test of evidence.

Possible research questions:

- How may learning systems for sustainability (LSS) create an entirely different way of communicating, reflecting and acting that avoids the New Age pitfall while being widely accessible?
- Which learning processes may attain profound understanding given the time and resource constraints from learning communities and individuals?
- How could capacity for 'integral scientific process' be built through LSS?
- **Fanaticism**: It seems obvious that dogmatic thought is harmful to our understanding of reality and to our development as humans. However, the environmental movement faces the risk of fanaticism when an uncompromised will to "fight" current tendencies that are perceived to lead to destruction of our and other species *takes over* rational thought. The risk is that environmentalism will become religious.

Fanaticism is a risk of any movement that is culturally translated as an ideology, and, given its high costs, should not be overlooked or underestimated but rather targeted *by design*. Philosopher George Santayana usefully defines fanaticism as "redoubling your effort when you have forgotten your aim" The development of reflective practices and the incorporation of a scientific style in learning experiences help undermine fanaticism by strengthening the role of rationality, but fanaticism may persist and must be addressed explicitly. Moreover, 'scientific fanaticism' is also possible. This for example happens when a majority opinion among scientists is elevated into a dogma; when non intellectual experience is deemed invaluable in principle; or when scientific endeavor is constrained by dogma to certain axioms or areas of inquiry –in short, when a true scientific approach ceases to operate.

The human cultural tendency towards fanaticism, religiosity, and self-righteousness is strong and should be taken seriously in any learning system design that aims to put forth a new worldview.

Possible research questions:

- How may LSS train against dogmatic thought?
- Fear: Fear is an expected consequence of awareness of various environmental crises. Fear may be an effective catalyst of action; however, action emerging from fear without understanding is prone to fanaticism (that is: fear may be an effective catalyst for ineffective action in relation to the future described above).

The use of fear as a catalyst for action does not honor human dignity and it sets the ground for manipulation. It is worrisome that fear is presently being used in many instances as a medium for environmental awareness and action (both unintentionally and intentionally). Fear is often transformed into anger, and this nurtures dogmatic thought –the most dangerous expression of action that is not

¹⁷ Santayana, George; <u>Life of Reason: Reason in Common Sense</u>, New York: Charles Scribner's Sons, 1905, p. 13.

based on understanding. On the other hand, fear may also be a paralyzing force, so its systemic effects are complex.

Recently, fear of the experience of the world in general due to looming socio-environmental crises, and fear of wilderness in particular, is being detected as a rising problem, particularly in children (the latter referred to as biophobia or ecophobia), adding and connected to the general new culture of fear emerging in human society.

Possible research questions:

- How may LSS be designed so that understanding and consciousness, and not fear, conform the basis for communicating awareness and promoting action?
- Given that fear is an expected *consequence* of environmental awareness, how should it be explicitly addressed and managed in learning systems design, particularly when directed to children?
- How may a learning community context effectively help individuals in the experience of fear?
- **Disregard or undervaluation of the human species:** In many instances the environmental context promotes a negative, contemptuous view of humans that undermines human creativity, dignity, and consciousness: the view of humans as virus and parasites of the Earth, the view of humans as irremediable destroyers, the view of Nature being better off without humans, the view that humans (or the human species, in an extreme) should sacrifice themselves for the sake of other species or nature—since this is the least we may do after the havoc we've created (a sort of religious guilt).

In some cases these views promote practices of conservation and restoration where humans living in the targeted areas are not a priority (which is possible if they are poor and politically unorganized). On the other hand, these worldviews have psychological costs to our self esteem *as humans*, and also convince many children and adolescents that older generations have *failed* them, promoting intergenerational hostility.

All this disconnects humans from comprehending themselves as part of a species in evolution, seeking adaptation to changing conditions. Instead, they infuse humans with a consciousness-undermining process of guilt and anger. The evolutionary view, in which humans are immersed in continuous adaptation-learning processes, strengthens human dignity and creativity, and thereby fosters the possibilities of conscious evolution as a species towards a future as the one described earlier. Under this view, humans are conceived as a unique (albeit risky) experiment of evolution: a species with reflective consciousness, able to observe nature in awe and wonder and recognize its beauty and its interconnectedness. That the human species is in an evolutionary threshold of understanding this beauty and interconnectedness of nature - which includes humans - is one of the opportunities of the environmental learning context (addressed below).

Possible research questions:

- How may LSS avoid views of disregard and undervaluation of human species and vigorously incorporate an evolutionary view?
- How may LSS promote a view where humans are conceived as a unique species capable (and therefore responsible) of promoting conditions for flourishing life on Earth? (Although maybe not *all* life: many viruses and bacteria -the most abundant type of biological entity on Earth- are not welcomed partners of humans and other mammals; and putrefied water reservoirs flourishing with bacterial life are not common visions of sustainability).
- How may LSS 'put humans as priority' of environmental efforts, in the sense of promoting socio-ecological sustainability?

In relation to the opportunities of the actual learning context for sustainability, two interconnected ones seem particularly important: the emergence and cultural appropriation of the concept of interdependence, and the possibility of connecting and fostering learning communities through the internet.

1. Interdependence: The concept of the interconnectedness of nature, which includes humans, is gaining unprecedented cultural ground. Some traditional societies developed cultures with a deep experience and understanding of interdependence (as is the case of some of the Native American tribes, for example), and some philosophical traditions have had for a long time highly sophisticated

theories and practices of interdependence (as the Buddhist traditions, for example); what is unprecedented is how widespread this idea is now becoming among humans, due mainly to the perception of environmental threats, and to a heightened understanding of ecological interdependence and biological evolution. This all allows for the emergence of an interdependence-awareness, since the arguments for it do not depend strongly on personal, religious, or cultural experience, and are thus accessible to a wide range of people.

Although this awareness is still generally superficial, grasping the phenomenon of interdependence is fundamental to understanding what is to be human *in nature* (not excluding urban environments); foundational for deep appreciation of other species and the rest of nature; and essential to the emergence and cohesion of learning communities. Therefore, seeking processes that take advantage of this opportunity and aim to deepen the understanding *and experience* of interdependence is valuable (indeed necessary) if true sustainability is to emerge.

Possible research questions:

- How could LSS promote a deep understanding of interdependence (both intellectual and non-intellectual) that enhances consciousness in a way that is independent of particular religious or cultural contexts? Through which concepts, processes, experiences?
- How should LSS integrate evolution theory and ecology?
- How can LSS be designed so that knowledge pertaining to different areas is interconnected instead of separated (as has been traditionally the case), thereby producing an interconnected design that shows interdependence both as content and structure?

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2. Internet communication: Internet makes possible that a net of individuals and learning communities interested in reaching sustainability, exchange information and experiences, thereby increasing our possibilities of adaptation and survival, as well as of promoting conditions that help other species adapt and survive. This is an unprecedented opportunity. Moreover, the very *structure* of Internet, resilient and self-emergent with millions of connected nodes of information, is a blueprint for the formation of a global net of learning communities for sustainability.

To fully seize this opportunity, learning communities and individuals must increase the *quality* of the learning experience that internet facilitates. Indeed, internet is such a new feature of our society that there is still a very feeble culture of scientific inquiry and dialogue helping distill and organize the enormous amount of information to which we have access. The accumulation of information is now less valuable than the capacity to discern information and understand the systemic processes of its production, the better to find valuable information and differentiate it from propaganda, misinformation, or half truths. This capacity need not be left to specialists but can and should be built into the consciousness of all members of any learning community.

The creation of online systems of collaborative inquiry is also crucial in order to maximize both creative innovation and research. Projects like Wikipedia and the like have already set the ground and proved that there is enormous will from ordinary citizens to participate in the generation of public knowledge, so that systems specifically designed for collaborative inquiry within a 'citizenized' scientific process would imply a valuable evolution of the possibilities of human collaboration.

Possible research questions:

- How may LSS build capacity for information analysis and discernment in internet?
- How could LSS help create and promote online collaborative inquiry systems?

For learning systems for sustainability (LSS), the present opportunities are as exciting as the risks are menacing. They may contribute significantly towards an abundant and peaceful future, but they may also become part of the problem. The possibility of a world full of connected learning communities that share the common interest of finding deep sustainability across diverse cultural, religious, economic, and political views is invigorating and encouraging. It also seems our best bet as a conscious evolutionary strategy. A learning system that not only permits but also foments creativity and diversity, and *simultaneously* promotes accords, is essential if we are to be successful. Diversity is more easily proposed than achieved: many views in the environmental context are more closed to diversity than it

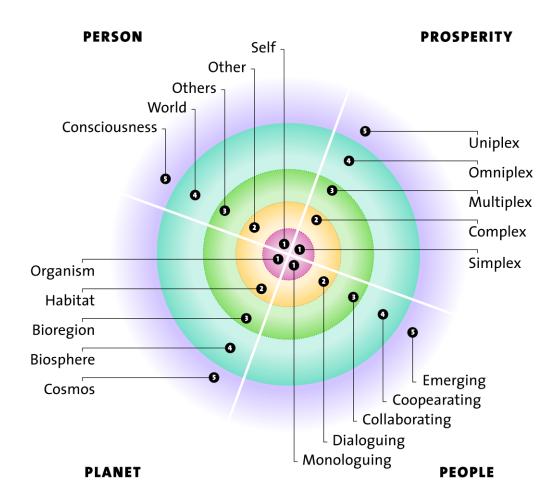
seems (and some are outright totalitarian, with everyone living in basically the same way, under a central global control). A diverse universe of inquiry where differences are nevertheless resolved through integral scientific process, has a good probability of emerging if superficiality, fanaticism, fear and undervaluation of the human species are forestalled, as well as if the emergence of interdependence-awareness and the internet blueprint for human networks are harnessed and enhanced. A human neurological system, within itself, is already a learning system where creativity and diversity may flourish while simultaneously resolving differences. It also permits the emergence (or expression) of auto-referential consciousness. One can only wonder at the possibilities of a larger, emergent, "neurological" system where each human participates in learning communities around the globe.

Discussion	Integral Sustainovation™ Model
Paper (Team 3)	Regina Rowland

Integral Sustainovation TM is a system (theory and praxis) for envisioning and innovating sustainable futures in order to help individuals and organizations move toward sustainable stewardship.

This is a theory about thrivability informed by multiple disciplines. Four dimensions of reality are addressed and interrelated: person, planet, people, and prosperity — including concepts of being & becoming, and doing & the infrastructure for acting. This particular way of slicing reality into its subjective and objective aspects on the individual and collective planes is unique to the discipline of integral theory (an emerging field of scholarly research synthesizing various ways of knowing, and is situated within integral studies, an emerging interdisciplinary field of discourse).

Integral models consider stage development (growth in stages leading to more complexity) as fundamental to the theory. The *Integral Sustainovation* Model describes five stages for each of the four dimensions.



Author's Image: Integral Sustainovation™ Model

Developmental Stages shown as concentric circles growing outwards

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In the personal dimension (individual subjective reality) individuals evolve from self to other to others to world to consciousness. The stages in the environmental dimension of the planet as a closed system (objective reality, singular) expand from organism to habitat to bioregion to biosphere to cosmos. In the socio-cultural dimension of cocreated and shared meaning (collective subjective reality) movement can be noticed through the dominant mode of discourse: monologue to dialogue to collaboration (across diverse perspectives) to coopearation (peers immersed in creative engagement across meshworks) to emergence. In the socio-economic, socio-technological, socio-political dimension of systems and psychological/tangible artifacts created by the collective for the expression of joy, health, and abundance (collective objective reality), we measure stage development through the form these creations take: simplex to complex to multiplex to omniplex to uniplex.

Integral SustainovationTM Praxis—ROIⁿ (return on innovation) was developed for individuals, communities, and organizations of all kinds (institutions, governments, corporations/businesses/enterprises) interested in transforming themselves into sustainable learning organizations that participate, consciously, in practicing new behaviors, innovating new products & services, and systems & structures through (re-)generative design from which new consumption patterns (from consumerism to coproduction), and the new economy (from profit orientation to value creation) will emerge.

Sustainovating means to stimulate creative flow within the individual and in groups engaged in creative play to innovate by following nature's blueprint from the future that wants to emerge.

The *Integral Sustainovation™* Wheel serves as a map to a) define the current state of consciousness in individuals and the current location of organizations on their sustainability learning curve — which reveal the immediate opportunities offered from those perspectives, b) (co-)design an intervention, and/or next steps, and re-pattern behavior, and c) analyze & measure success of action(s) taken and/or personal growth.

Discussion
Paper (Team 3)

From Systems Thinking to Systems Being: The Embodiment of Evolutionary Leadership

Kathia Castro Laszlo

Synopsis

My interest in the learning systems for sustainability team of the 2010 Pernegg Conversation is a reflection of my learning and practice as an educational systems thinker/practitioner in the domain of sustainability and the roles I play in this regard: as an educator, consultant, coach, social entrepreneur and mother.

Systems thinking has been a means for enabling critical and creative perspectives from which ideas for improving a difficult situation or innovating a new possibility emerge. However, no matter how powerful this way of thinking is, there is more to the task of catalyzing evolutionary transformation toward life-affirming, future creating, and opportunity increasing realities. Designing learning systems capable of fostering such orientations is a call for participation in the most important task of our time: to innovate a future of peace and abundance in partnership with all the living systems of our planet Earth. This is not a task for a few privileged, "enlightened" ones, but a responsibility for every human being.

If the insights from systems thinking and practice will be of help in the transition to a viable future for all, they should not be restricted to books and the halls of a few universities, but they need to become part of the social fabric that informs our cultures: the narrative that gives purpose and meaning to who we are, why we are here, and where we are going as a global civilization.

Outline of research interests

- 1. From systems thinking to systems being: The evolution of our way to perceiving and living in the world
 - a. Systems thinking and seeing
 - b. Systems feeling and willing
 - c. Systems being and living
- 2. Evolutionary leadership: Bringing it all together
 - a. The evolution of leadership
 - b. A new leadership for a new world
- 3. The role of evolutionary leaders
 - a. Communicating the new paradigm
 - b. Living the new ethic
 - c. Co-authoring the new narrative
 - d. Designing learning systems for sustainability

From systems thinking to systems being:

The embodiment of evolutionary leadership

Discussion Paper (Team 3)

Global Learning Systems For Sustainability

Helmut K. Loeckenhoff

Abstract

As all life systems, Learning Systems represent purposive systems. As to design appropriate and effective learning concepts, the purpose needs be clarified in sufficient detail. As the overarching issue sustainability is set, as to secure survival, procreation and development. In the given context, sustainability mainly points to two targets. The first is tied to the systems performance and its results. Learning systems should successfully teach how plan sustainably, to design and to act; that is to opening and not close chances and future prospects of life. The second follows from the first: the learning system itself should be outlined as a sustainably self-improving, as a (meta-)learning system. It should flexibly respond to both actual and future contexts as well as to changing needs to learn. Under these auspices the concepts of 'learning systems' and of 'sustainability' are analysed and specified from the requests given and from the essential qualities required to meet them. Details are discussed under topics of a systemic, comprehensive understanding of teaching and learning systems. Systemically and pragmatically teaching and learning must be seen mutually complementing. Both aspects need be conceived as the means to guide and to control rapid, fundamental change both operational and in particular strategic. Sensible issues, design and networking and with existing organisations as UNO, UNESCO, or eventually NGO's are considered.

Excursus: Designing Learning Programs for a Worldwide Meta-Organisation

The general context addresses the complexity, in particular the interconnectedness of global and regional challenges. In analogue, the relation reflects the ways human life interacts with its inner and outer environments. Against this background the first of two main objectives followed, demands to recollect teaching/learning programs literally on all levels of societal structures and processes. The other aims to design a meta-organisation to organize and network teaching/learning systems on all levels and between all social units involved. They should encourage dialogue, co-operation and mutual learning. Learning thus should be self-organizing and self-driving. Closely tied to sustainability, the support to build a self- responsible identity and shared identity manifest as the core of the innovative character of learning. Innovation lays the base for Evolutional Learning for Guidance and Control (the GECL model) to plan and to guide fundamental change. Learning from experience is complemented by learning from probable futures.

Setting the Stakes for Argumentation

An appropriate agenda may follow the above reasoning.

- (Prologue) On Learning and Sustainability of Life Systems.

Learning is one of the cogent, if not the most essential quality of life systems. Human learning and social learning must be understood and guided from the basic functions of learning in Life Systems. Life systems include as well the single learning unit as the individual in the teaching/learning environments. Individual learning takes place, is stimulated guided, supported or hindered as well by the natural and the social environments. Learning is dialogic, an evolutional process on all levels. In globalization and within the narrowing limits of the space ship Earth, learning, the acquisition and transfer of knowledge (and of knowing) cannot be seen locally, ethnically, geographically, etc. isolated. As the economic-political development manifests, the worldwide shifts are closely tied to learning (if by differing means). The measure scale for developmental success will be the sustainability – which means the Innovational quality – of learning.

- (Introduction) The building of **Teaching/Learning** systems (T/LS) their role to survival and development of social systems **worldwide**.

Life of any kind is based on constant learning and co-learning to survive and develop. The faculty to co-operate as well as to compete over scarce resources rely on the sustainability of co-learning efforts. To cease learning is as deadly as to maneuver into evolutional cul-de-sacs, into niches destined to dry out. History shows that these rules apply likewise to social, to ethnic or political groupings up to the rise and fall of entire societies and imperia. In reverse sustainable learning offers the chance – the only chance by that – for the continuous *innovation* and *rejuvenation* which are preconditions to stay alive and proliferate. These basic rules of learning apply to all levels from physio-physics and physio- chemistry to highly complex societal form and the constructs of higher consciousness, as e.g. ideologies and religions. The transdisciplinary model set underlines the crucial functions of learning in all developmental and evolutional processes.

- (1) Dealing with Complexity Semiosis Dynamics in T/LS. When systemically viewed, actual Contexts pre-given by evolution and history, are, first, dominated by rapidly growing complexity as a main characteristic of every evolvement. Change on human societal levels coupled to evolvement reflects complexity in affecting virtually the entire societal webs in ever widening circles. To cope with change means first to understand (by learning) how to meet increasingly complex challenges. Complexity dynamics are inevitably paralleled by a rapid dynamic re-configurations in meaning and meaning networks. The term meaning addresses purpose and intent behind any barely repetitive behaviour in living systems. Meaning ranges physiological survival and development to meaningful social behaviour, to power driven ideologies or religious convictions in the domain of mental constructs. Recently biosemiotic research has showed the close co-action of complexity and semiosis dynamics. Emotionalisation and ethnisation of conflicts, religious power fights, but also e.g. the impact of ICT (Information and Communication Technologies) on the understanding of privacy and of identity, contribute vivid examples. Too little research findings are yet available on the resulting requests on learning modes and institutions. Learning to cope with complexity and semiosis dynamics need develop systematic, deliberate efforts to teach modes towards guide change. Learning politics have to take into account preconditions and possible consequences long range and world wide. Planning schedules, operational and strategic, as well as control loops / helices have to be taught. That needs be done on the family and group level as well as by institutionalized teaching/learning systems. - Teachers must be trained and upgraded in parallel to changed request and advanced learning programs.
- (2) Phase Transition requests root learning. The actual phase of development is signified by the increasingly rapid and fundamental nature of the ongoing change. Abrupt changes might be expected, the outcome of which cannot be predicted with reliable precision. Nor can be the course of the so called phase transition under way. Such transitions have been experienced around WWI and WWII, altering the very base of societal life. How to meet them? What is to be learned if possible beforehand? - The inquiry of Phase Transitional States virtually compromises all aspects of the systemic societal base, its structures and its life processes. Which factors establish a society, which keep it together, which let it fall apart? Change will affect all factors in depth, as can be actually observed. Which are the modes and instruments to guide and control society, namely change in turbulent times? According knowledge will help to guide - id est between self-organization and strict control - in transitional times. That takes place on the individual as well as on the societal level. - The impact of global change will affect culture and identity felt. To soften cultural incompatibilities and cultural clashes, cultural learning is enforced as to understand the challenge and to deal with. Such knowledge must be taught and learned, fulfilling provocative requests towards teaching and learning. The impact of aggressive religion, in Europe and worldwide, supplies but one outstanding example enforcing sophisticated teaching and learning on both sides. Not least the very identity of the individual as of the society as a whole is on stage. How to re-learn identity? In general, socio-semiotic shifts force to teach and to learn 'soft' essentials as to understand and to deal with them. Non-violent conflict resolution, not least, ought to be integral part of the curriculum. It constitutes but one of many 'soft skills' to be taught and learned.
- **(3)** Concepts of Sustainable Learning Systems. To teach sustainability, i.e. transferring sustainable knowledge, focuses on teaching how to learn and *improve learning*. The half life period of data and factual knowledge is short and further shortening. The capacity to learn and meta-learn turns out a salient advantage in the world wide competition and hopefully co-operation based on

learning. Learning to learn means to be able to innovate and adapt actively, not least to meet unprecedented emergency situations. Such future oriented teaching/learning systems must be subject to sustainable teaching/learning themselves. T/L systems need adapt to new situations, to novel means of teaching learning, and to upcoming requests to be faced.

According tasks, principles and constitutions must be scrutinized both locally as within a worldwide policy to help to guide and control change by providing knowledge. Sustainable Teaching/ Learning systems focus on the integrated transfer of factual and procedural knowledge as a base. They further meta-learning, skills, and not least, make aware culture and identity and its changing features in further learning. On the thus extended base the desirable determinants of the learning systems will be reflected as to their efficacy and robustness; as well in their respective levels as related to the knowledge gain by participants involved. Programs for learning and training are to be designed correspondingly.

- (4) Design, Operation, Control; Education Policy. The environments a T/LS has to fit into are pre-given by the pre-qualifications of individuals, and existing or missing institutions on local and global levels. A central role is assigned to the local communities, the core of social nets, entrepreneurial ventures, projects, or innovative assignments and so on. The fact is corroborated by practice e.g. in the RSA and other emerging countries. Against this frame existing institutions are depicted and evaluated. Missing institutions, connections and capacities are identified - and the causes and reasons why this is so. Essentials may be learned from the answers, costly detours and ill placed investments be avoided. Again this is affected both local and global. One should be reminded - see above - that T/LS connect to and grow from culture and civilization roots. - The efficacy of teaching/learning efforts reflects the societal constitution and performance and can be valued as an indicator for the future developmental prospects of a region. - The efficiency and effectiveness of T/LS is determined by two faculties. Learning may either take place ex post, extracting structures from experiences acquired in the past. Ex ante learning is realized when on the base of past experience prognoses are derived or constructed including active policies depicting possible and/or probable futures. As research on primitive and deprived groups elucidate, teaching/learning surmounting its most basic forms begins when planning into the future is worthwhile. - Finally here, dependent form the general knowledge standard, the methods of teaching/learning may come very different. Learning by doing, by mimesis, on the performance of the tasks to be learned can be very useful also in more sophisticated T/L programs. In further advanced learning participative learning or action research learning may be included. - Teachers and their students form a dynamic system in themselves. Teaching and Learning form a unity. - Learning by definition is intended to change behaviour. The normal learning programs focus on skill, on factual and procedural knowledge. A particular issue turns out to teach attitudes, values systems, ethical and moral stances, co-operative and competitive behaviour, communication, knowledge exchange, visions, understanding of human destiny and other foundations and rules of social behaviour. Highly important for the semiotic aspect of T/L, behavioural learning requests need be dealt with separately.
- (5) Worldwide T/LS Networking. The worldwide proliferation of change consequently requires worldwide T/LS. They request, on the most general level, a Worldwide Meta-Organization. This is designed to take over the coordination of distributed efforts e.g. on the local level or specialized for example to general education or professional training. It monitors the educational standing in different areas and localities, offers methodical help, teaching/learning materials and funding. It guides and controls educational efforts. It will outline and offer systemic teaching/learning programs, help install and implement them and may run a task force for cases of urgency. In particular UNO, UNESCO and affiliated organizations operate worldwide organizational frames. They offer a starting point, and a fund of experience to profit from when building an own network. Conditio sine gua non remains the need to define the issue to be pursued by a worldwide organizational frame and its specific domain of operation. On the local level related parts of the educational systems up to NGO's and private initiatives in emerging countries are to be taken into account. Their networkings are to be assessed whether and in which mode they might provide a specialized scaffold to institute learning for sustainability. It might but complement and extend existing facilities to that end. Emphasis is laid that T/LS are designed to respond and adapt sustainably to the changing environmental conditions and newly emerging task. They should in particular reconsider their own systemic performance, furthering creative, innovative thought and intent. That includes to continuously teach the teachers and change the system according to actual and strategy requests. In the learning context the very concept of

sustainability ought be specified and reconsidered as to its probable ambiguities. The systemic character of teaching/learning systems should be emphasized and employed to initiate *meta-learning* as aforementioned.

- Systemic Community Principles. To establish a learning community introduces change in two major ways. The first immediate one alters the communal climate of co-operation and competition, the atmosphere of togetherness. Who learns gains in tendency superiority as compared with the non-learners, a fact that may affect also the relations between neighbour settlements. The second change relates to the future: the aim of learning is to change willfully and systematically. These prospects have to be fitted into the web of personal relationships and to the culture. Thus the project needs be carried by the opinion leaders and be the affected. It should be clear, where the act of learning as to change will fit into the culture, and where it may disturb traditional roles of age, gender, ownership etc. The ubiquitous resistance to change can be countered but by the hope for a more appropriate life. That should pre-emptively make well understood. As mentioned afore Western modes of culture and in particular around the principle of performance should be abandoned as the authoritative models. - One of the most difficult tasks will be to link T/LS with the indigenous culture of performance. - As it is trivial but not always seen, the environments, the actual situation and their carrying capacities set the potentials and the limits. For example measures to reduce the mortality of small children must not lead to a growth of the population. Countermeasures, here as in other cases, where traditional limits are transgressed, are necessary. Planning in general needs be holistic; planning a T/LS includes comprising 'check an balance' monitoring and implementation. The contrary of 'good' is 'well intended' but not controlled rationally. -Overall, to introduce learning should be designed, planned and controlled as a learning process in itself. It must allow for the unexpected and the outright impossible to happen and to be dealt with. Computer assisted project management will not be the kernel, but the rational/professional backbone of successful learning. - To ensure sustainability, allies need be found. Who might be interested in people with basic training and education and might be inclined to help? The well tried triad of learning professional facts, skills and self-esteem based identity, will eventually foster entrepreneurs and entrepreneurial self-organization on whatever level. Learning proves sustainably successful when it turns into a self-propagating activity.
- **(6) Backing up and Funding Sustaining Learning Efforts.** Learning does not take place in a vacuum. Its efficacy is dependent on appropriate political, social and material e.g. economic conditions and these from the future prospects they offer. T/LS need by securely and sustainably funded and supported professionally. With increasing quality of the knowledge base and economic/societal emergence the learning and educational systems need constantly change. The implementation of a learning/educational system means to build a lasting and reliable *institutional frame*, putting particular weight on the *training of teachers*. Further education after the normal curriculum needs be supported. So do special efforts for training on the job and fundamental training for grown up persons *in advanced* and *further education*.
- **(Epilogue) Chance and Challenge Learning.** Teaching(/Learning Systems are the only chance left to prevent anomie and eventual destruction and long range deterioration in the course of worldwide power, culture and economic shifts. The need be worldwide, networked, locally and globally rooted.

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Discussion Paper (Team 3)

Radical Innovations embedded in Enabling Spaces

Thomas Fundneider

Since several years, my thinking and doing focuses around two main concepts:

- Generating profound new knowledge
- Designing Enabling Spaces

In my view, both themes may have some input for the general topic of our IFSR conversation. I am glad to share with and contribute to our group.

In more detail, and starting with the first mentioned topic above, I am interested in the question, how something radical or game-changing can be brought forward without being "too radical" and therefore not "anschlussfähig" ("connectable"); so the radical new must somehow respect what is already there, as it stems organically from the core of the innovation object (be it a learning/business model, service, idea, etc.) and its systemic environment. This resonates well with the idea of "creating" new learning systems: do we already understand what is there? what wants to emerge as potential learning systems for sustainability? can we yet see it? In this context, a central question I asked myself, is: do we have to design dedicated learning systems *FOR* sustainability, or is (resp. will be) sustainability becoming the core from which everything else emerges? With regard to this topic, I am quite influenced by C.O.Scharmer's Theory U, dialogic and reflective approaches (Bohm, Isaacs), and Design Thinking (which is not about design, but about the approaches, methods and tools design-oriented professionals employ in order to bring forth new knowledge).

Referring to the second topic, enabling spaces, I am highly interested in the question, how can we orchestrate and configure a subtle set of constraints and facilitating structures that interact in such a way that knowledge creation can be supported and sustained in the best possible manner? This of course is based on the assumption that we cannot "produce" automatically (like an algorithm) profound knowledge. So we need concepts, styles of thinking and attitudes that are not classical analytical and linear thinking; systems thinking and the concept of enabling acknowledges that we have to accept that most of the underlying processes are beyond our control and unpredictable. However, this all doesn't happen in a theoretical and/or empty space. So I would like to add the dimension of a concrete space for learning systems to our conversation (if appropriate) –with an understanding that this (architectural space) needs to be integrated with social, cognitive, emotional, cultural, technological, epistemological, etc. dimensions.

Discussion Paper (Team 3)

Mobile Interactive Information System for Learning based on Sustainability

Susana Isabel Herrera

The International Institute Galileo Galilei (IIGG) is the research unit of the Argentine Foundation for Talent and Ingenuity (FATI). This foundation is recognized as a non-formal higher-education institution. Therefore, in addition to research, FATI develops the following activities: higher education services (through Colegio Mayor Universitario), consulting professional services (through the Prospective Consultant), studies of regional culture (through the Cultural Center *Sapientia*), monthly colleagues meetings - using conversations as an interactive methodology (through the Permanent Seminar *Café Xperts*). FATI is a learning community; it studies the complex reality from a systemic approach and it produces new scientific knowledge based on new paradigms of the twenty-first century and on Santiago del Estero culture.

FATI is a learning social system characterized mainly by the following features:

- It is an evolving system: it adapts itself to its environment changes. FATI realizes that transparadigmatic jumps are needed to study the complexity of current phenomena.
- It is systemically organized: its activities are developed throughout eight different units (or subsystems) each of which has its own goals but they work in an interrelated and interdependent way.
- It is founded on a *Systemic Epistemology*. This epistemology has been developed by IIGG and was exposed by Maria Mercedes Clusella at IFSR events.
- FATI always acts from an explicit ethic-philosophical point of view. This corroborates Matjaz Mulej's statements: ethics is an element of social human-being systems. FATI's ethic-philosophical position is focused on *intelligence* and *sustainability*. Based on José Antonio Marina's ethics of intelligence, FATI is continuously promoting young people's creativity and innovation; this is the reason of its name *Talent and Ingenuity*. On the other hand, FATI argues that an ecological ethic is necessary to preserve our planet. Ethic of learning systems must consider harmonic relationships between humans, and between humans and the Earth. FATI studies real world phenomena without destroying life and trying to preserve future generation's life quality.
- FATI recognizes local own culture as a *mindscape*. Local culture determines how people know the real world. FATI's local culture is called *santiagueñidad*. And it is mainly studied by its artistic expressions: music, sculpture, writings, legends, etc.
- FATI uses virtual learning methodologies based on new information and communication technologies. It has implemented a virtual platform -called Virtual Collegium- using e-learning strategies.

Most people use technological equipment in their ordinary life. So learning social systems must necessarily consider virtual relationships, they should be supported by virtual social networks. In this context, an information system research (a Ph.D. thesis Project) is being developed in FATI. The topic is Mobile Interactive Information Systems to support Postgraduate Training – it refers to a software system called *e-mentor*.

Learning for a sustainable world requires:

- Permanence. Learning is a continuous process that takes place throughout life (Life-Long-Learning). Postgraduate training requires the widest period of education, from 30 to 80 years old; so FATI focuses on this educational level. People achieve some global and specific skills at undergraduate courses. However, at postgraduate courses, they reflect on ethics, aesthetics, epistemology, sustainability, etc.
- Autonomy. Usually people study at formal education institutions until their graduation: primary school, secondary school and university. But from graduation, when people start their careers, learning should be autonomous. The person decides what, what for and how to learn.
- Being Systemic. Involving ethical and philosophical stance on learning means that people learn not only from a scientific viewpoint but also from a life perspective. Learning process involves every aspect, condition, skill and personal development. On the other hand, learning should relate personal new knowledge with the existing community knowledge and with near environment and global planet needs.

- Being environmentally friendly. Learning should occurr consciously considering threats to humanity (e.g. extreme global ideologies, fundamentalism) and to Earth subsistence (e.g. environmental destruction).
- Interaction. People learn by interacting with other people in real or virtual communities or with virtual educators, by using interactive ubiquitous learning systems.

My interest in participating in Team 3-Pernegg Conversations mainly lies in the possibility of sharing FATI experience as an example of learning system for sustainability. And a secondary aim is to learn other systemic-cybernetics strategies used in learning communities who seek sustainability. This will be useful to strengthen the theoretical foundations that support the Mobile Interactive Information System *e-mentor*, which is being developed in my PhD program.



Team 4: Towards Integrative Systems Engineering: A Case Study Derived From Movement Of People, Goods And Information

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The group also acknowledges the useful contributions made by the following during the input paper phase: Mitsutoshi Kawasaki (Japan) and Janet Pyle (UK)

Summary

The paper explores a hypothetical urban transportation problem as a basis for developing a more "systems rich" form of a systems engineering approach. We believe that our chosen method of consideration of urban transportation represents a more systemic approach to a complex case study. Rather than considering the problem of transporting people and goods, we consider the movement of people, goods and information as one system while traditionally one uses information as means to improve the transport of people and goods ('logistics'), thus limiting the scope of the system boundary. (Information and Communication Technology) is also recognized as a



lever of change and as a typical source of counterintuitive effects. When used effectively it has the potential to reduce traffic loads and or journey times, a feature we would hope to exploit; but it also has the potential to increase traffic flows such as for leisure purposes. People learn of more opportunities for leisure e.g. an art exhibition, through faster and more pervasive ICT and this stimulates their response to travel to it.

Most emphasis is given to a design methodology which brings "requisite variety" (Ashby, 1956) through user-designers being involved in all aspects of the design of the exemplar improved urban transport system. The wider boundary considerations provide the potential to increase acceptance and reduce undesirable repercussions caused by introducing change.

The paper identifies the additional considerations that would be reflected in the key phases of a typical systems engineering design process. We call this enhanced process "Integrative Systems Engineering".

Background

This report provides a summary of the progress made by Team 4 at the IFSR Conversation held in Pernegg (the 16th IFSR Conversation) from Saturday 10th to Thursday 15th April 2010. During the pre-conversation team formation stage YH had suggested that the systems engineering domain be explored in the context of "a new urban, personal door-to-door transportation system: a demand articulation for city dwellers", in that this would provide a focus as well as investigating a key problem affecting many nations. However, the input papers from the group members strongly emphasized the need to consider and develop a method of applying systems thinking to many similar problems. The intent was to cover both the general and specific issues surrounding the introduction of creative new technology including ICT, and the issue of matching demand to supply with the aim of allowing consumers to have a greater say in the introduction of new technology.

Introduction

This paper covers the phases of:

- Our initial exploration of the topic
- Steps towards our focus of inquiry
- Development of a systems design for a "Problem Champion" in a transportation context.
- The emergence of a new perspective of Integrative Systems Engineering as reflected by a summary of the key differences between our proposals and that of typical systems engineering practice.
- Some first thoughts on emerging technology and projects related to an integrative transportation system.
- Conclusions

Initial Exploration

Our initial exploration of the topic, some carried out on Saturday evening, was focused on scoping the area, particular concern on purpose and boundary. We also discussed the process of our conversation and the output we desired. It was agreed that we should endeavour to complete the reporting requirement as far as possible before we left Pernegg, and that the latter part of Wednesday should be allocated to the completion of the first draft. We decided to capture our initial thoughts on a flipchart laid horizontally (Walton, 2006) on the table so as not to ascribe any apparent authority to the person standing at the chart. All members were invited to write notes on the flip chart.



¹⁸ The term Problem Champion seems more appropriate in his context than the more common term of problem owner

Questions Raised

The questions tabled related to the scope were:

- 1. Should we explore the introduction of new technology as a *general problem*, or *focus on urban transport as an exemplar*? The view was that the latter would provide markers for the general area, and that such a specific problem would be of interest to INCOSE (International Council of Systems Engineers). Team 4 had been requested in the introductory session to consider sending a representative to the INCOSE meeting (in Chicago) which precedes the ISSS 2010 Conference (Waterloo, Ontario) in July.
- 2. Should we consider urban transportation in a *developed* or *developing country*, or should it be a *specific city*? Because group knowledge was largely linked to the developed world, this would seem to offer most merit. In short we lacked the requisite variety to consider issues in the developing world. The question of a specific city was left open. While major cities had some common characteristics, their individual situations varied due to culture and history. We were inclined to consider a city in a generic term, with Vienna and its Mayor often mentioned only as an example and as a possible focus of discussion of a Problem champion, and Stakeholders of a city.
- 3. What should be the *timeframe of consideration*? Was it to be focused on a current context based on what we can do now with some current *and emerging new technology*, e.g. Segway¹⁹. If this is the case what would be the incremental steps on, say, a case study of a *hypothetical area of 5 x 5 kms*. Alternatively, should we be focused on *idealized system design* with a *20-30 years horizon*, *or even longer 50-100 year horizon* (see also Crawford 2002)? We recognized that a longer term view provided a better chance of changing culture towards personal transportation. Changing behaviour patterns and mobility demand is vital in the context of conserving resources, and reducing pollution.
- 4. Was our initial trigger the correct starting point? "Personal" as stated in the trigger needed further definition. "Personal" sounds like an individual need, but we should take into account that some groups need to cater for more than one person. The needs of a mother could include the requirement to get several children to school and back.
- 5. What to transport? We decided to take a new, broader approach, by considering People, Goods and Information (PGI). This required us to consider their similarities and differences. We also investigated briefly the possible extent of "substitutability" of PGI items by one another. e.g. sending an email instead of a letter, accessing a home page instead of enquiring at a railway station counter, and wider use of systems like Skype.

ICT and Its Potential Impacts on Traffic Loads

ICT (Information and Communication Technology) was a potential vital lever for change. One issue was to what extent ICT could reduce physical movements. It obviously eliminates the need for some travelling, especially for acquiring information somewhere. There is, however, also a danger that ICT and telecommuting could well result in the generation of more travel than it eliminates. Indeed, one study has highlighted a counterintuitive effect in that information can increase transport demands. According to Graham and Marvin (2001)

"Rather than simply being replaced, transport demands at all scales are rising in parallel with exploding use of telecommunications. Both feed off each other in complex ways, and the shift is towards highly mobile and communications technology"

We felt that we could offer some support to this conclusion. The advertisement of leisure opportunities by a variety of ICT means could well stimulate travel e.g. to a new art exhibition that previously would not have had wide promotion. However, we recognized that this is a complex area.

¹⁹ The Segway is a self-balancing electric vehicle for one person. It has with two wheels in parallel one axis. Computers and motors in the base of the device keep the Segway driving upright, the passenger enacts control by leaning forward or backward. It is already on the market.

Experience from Tokyo suggested that the current transportation network was not, in any case, used to best efficiency. A journey in Tokyo is best undertaken at different times of day, using a combination of different transport modes. During one period, going from A to B might best be done using say, surface bus, subway and walking; and then in another period by walking and then subway. Knowing what to do for the best traveling means in terms of time and / or comfort is not clear, though the technology to improve this, using mobile phone, is now becoming available. Knowing what to do, and when to do it, is an area where information could help travellers. We believe that relatively little data on the purposes of travellers is known and such data sampling, collected on an anonymous basis, could be beneficial for modelling and determining the effects of potential changes. These data could usefully be extended to cover visitors and tourists coming to the city.

There are possible counterintuitive effects when attempts are made to drastically change systems. For example in the case of reducing population in urban areas to reduce air pollution levels. Moving population out would increase commuting and fuel consumption for travel between the surroundings and the city and in the surroundings themselves. This GC described in terms of the Floriani-Principle 20.

To see whether these issues could be examined through a light application of a Soft Systems Methodology (SSM), see (Checkland, 1981, 2009) we drew some simple systems maps, seeing whether there was a feasible or desirable system for change, or a root definition of a relevant system. There was little prospect of completing an overall systems map of generic problems due to complexity, and the lack of diversity and requisite variety in the Team.

Entry Point For Further Discussion

LS suggested that in order to provide an entry point for discussion each team member should write down what for them was a key question they wanted the answer to. This we did on the flat flip-chart (Walton, 2006). As we did this every team member added to the points and discussion followed. The points that arose were:

- How to change attitude and culture towards public transport? Financial levers are the most common ones used by national and civic government, e.g. taxation, congestion charges, and tolls. Are there other incentives which are not penalties? Will pricing make a difference, indeed what be the effect of free travel?
- How to exploit the possible public goodwill towards changing of values and ethics by stressing the benefits of change i.e. reduction of fossil fuel use, air pollution and land use - against the possible increase of inconvenience and time spent travelling?
- How to improve the effectiveness of public transport to overcome the convenience of the car, its luggage capacity and its social status²¹? Visual design of public transport (aesthetic perspective) is a potential lever for change.
- How to deal with relationships between boundaries e.g. city/town planning and health management systems?
- What role can ICT and information movement play in reducing movement of people and goods?
- What is the nature of the movement of information in the broader sense?
- Leverage points in general were agreed as key considerations the key questions are what to change, and why, and what are the criteria for choice?

We then constructed a systems influence diagram to cover these points (see diagram in Fig. 1 below).

As we continued our discussion we found ourselves taking a hypothetical position of submitting a proposal for the re-design of movement of people, goods and information to the Mayor of Vienna, as the problem champion. Hence, our focus at that point was 2010 with the current and emerging

²⁰ Saint Florian is an Austrian saint believed to be helpful in preventing fires. A well-know prayer is: "Saint Florian, don't put fire

on my house, put it rather on ten other ones". Hence the term ,Floriani-Principle'.

21 A Viennese anecdote from around 1900 underlines this dilemma. A rich banker was advised by his doctor to *walk to the office* for health reasons. He did, but in order to avoid the impression that he could not afford to pay for a cab, he had an empty cab follow him.

technology. However, we also recognized that such a dialogue might need to change in a different cultural context (Hofstede, 2005).

At this point we had what is often described in conversation terms as an "Aha!" moment. The realization was that we could not design a system approach for generic transportation problems and for all contexts. We were better placed to design a systems-based toolkit to help a problem champion (e.g. the Mayor of Vienna) deal with their specific case/context. This led to the formulation of the following draft statement for submission to the full Pernegg conversation group:

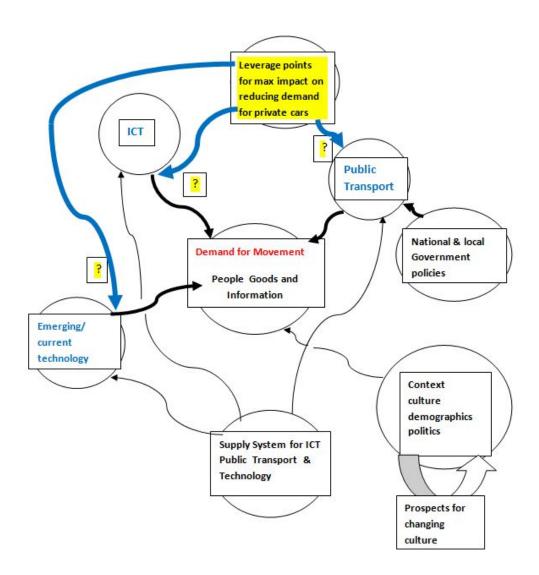


Figure 1 Influence Diagram on Demand for Movement

We, Team 4, seek to
Design a system of inquiry

for

How to design a system which

Will help a problem champion reduce/solve/ameliorate/improve the movement of people, goods, and information.

Development Of Inquiry Design

Reflections relating to an Initial Dialogue with the Problem Champion

We would expect any major city to have the following features as a systemic description of the patterns of growth in demand for mobility (Geerken, Vercalsteren and Borup, 2009):

- Increasing population as result of greater life expectancy
- Numbers of households increasing, due e.g. to divorce and youngsters leaving their home more often and much earlier
- Increase in double income households
- Internationalisation and globalization (high levels of imported goods)
- Urban sprawl
- Increase in welfare combined with available leisure time
- New needs for (international) mobility in wider networks due to rapid growth of ICT

We assumed that a particular context might have a particular opportunity to exploit an emerging technology, or have identified a particular problem that might be important to address. Another question is whether the aims need to cover disaster planning, this could be "slow onset disaster" e.g. city centre congestion or "rapid onset disaster" e.g. earthquake or Tsunami. In Vienna we would not expect to deal with Tsunami!²² See (Mrotzek, 2008, 2009) for various archetypes of the dynamics of catastrophes.

As a precursor to designing a "design system" we discussed how to approach a typical problem champion and how to open the dialogue both in the context of process to be adopted and the content/boundary of the investigation. We felt that three areas were particularly important:

- The need to ascertain whether the "consultancy" design, which was in effect what Team 4 was exploring, would be primarily "content" based, or "process" based.
- The need to include diversity of opinion into the stakeholder group.
- The need to evaluate any methodology process.

Prima facie all consultancies will have both a content and process element. One interest here is, which component will predominate.

Diversity of Stakeholder Group

As systemists our general intention will be to involve a "necessary and sufficient" group of stakeholders in the design consultation process. This would enable the design process to benefit from diversity and wider requisite variety. The stakeholder group should include all the normal representation that would be expected in an engineering project, e.g. technical specialists from existing /potential suppliers, political and financial experts. But it must also include "end-users" i.e., those who use the current system, those affected by the system, and those excluded or otherwise disadvantaged, by the current system (e.g. the disabled). If a large and complex system is under consideration, with possible political issues being buried beneath the surface, it may not be as straightforward as we would like. The project champion might have his/her own views or have been given views by an internal advisor. Thus it would be important to stress the value of involving the "user-designer" in terms of several dimensions:

²² Ironically, Team members were caught up in a sudden onset disaster affecting their travel home at the end of the conversation. The Icelandic volcano eruption on 14 April caused the shutdown of airspace over much of Europe for several days. The sudden removal of the air element of international travel caused extensive systemic effects on other forms of travel and accommodation at international, national, regional and urban level. It was evident that no planning had taken place at any level for a disruption of this kind. We would hope that in future, planning for the problem of sudden removal of "single elements" of transportation systems does take place.

- **Ethical and Philosophical level** it is unethical to design for someone else. The designers of a system should include those who use the system or who are affected by the system (Banathy, 1996).
- Economic level there is no point in designing a system which no one uses.
- Political level involving local citizens in decisions on a key project could be a vote winner.

The selection of an initial group of stakeholders for a core consultation group might also lead, following their interaction, to suggestions for more stakeholders to be involved. The issue of numbers and value of stakeholders is challenging and a UK Institute of Environmental Management & Assessment (IEMA) publication (IEMA, 2002) provides some useful guidance on this. The crucial point will be the clarification of the initial boundary for stakeholders.

Clearly there is a need to put a limit around numbers of stakeholders to form a core consultation group - both in the sense of "law of diminishing returns" and group management. GC proposed that this be restated as "law of diminishing contribution", and that when this point is reached we have "closure" (in a logical sense) around the stakeholder core discussion group. The problem of consolidating and integrating many different stakeholders was discussed at length in (Chroust, 2004) when analysing Agoras with large numbers of people.

Outside of the core group, opinion-seeking surveys might be useful for specific types of questions. The diagram below from the UK IEMA (IEMA, 2002) provides helpful ideas on participation levels and selection of techniques. In view of today's possibilities of ICT it should be augmented by electronic conferencing systems, interactive electronic discussions, blogs, etc.

Evaluation

The interactive participation of many stakeholders is of key importance, especially in the very early phases of the conceptualization of a system one needs a wide discussion with all potential stakeholders. Problems with such democratic approaches were discussed in (Chroust 2004, Espinoza, 2004, 2005).

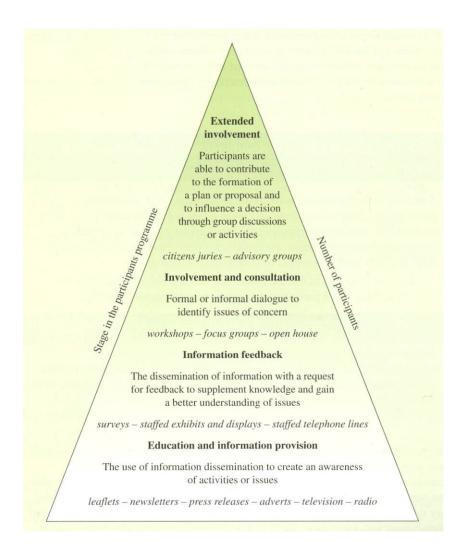


Figure 2 Levels of participation, techniques and factors influencing the selection of techniques

Search for Methodology

In the design of a technical system there are several types of tasks which considered the system from different viewpoints (usability, technical feasibility, cost, coarse-grained structure, fine-grained structure, ...) and thus address different stakeholders and different types of problems (Chroust-2010).

Following ISO 15288, a standard for developing technical software systems, the activities can be depicted as in Figure 3 below. It has to be stressed, that the diagram only shows the *logical* order of the tasks, but does not imply a specific sequence in which parts of these tasks will be performed and many feedback loops and iterations will be needed. For example, one could define some of the specification, then based on that do part of the design and then do the next part of the specification. Feedback and re-doing of previous work is also often necessary.

The more innovative and conceptually creative a system is, the more importance (and time and effort!) has to be put into the early phases. This is especially with respect to understanding what the system should be designed for. ISO 15288 distinguishes two 'start-up' phases: 'Stakeholder Requirements Definitions' where stakeholders set down wishes and, 'Requirements Analysis' where a single set of feasible and consistent requirements is created.

This is similar to Soft Systems Methodology, SSM, (Checkland 1981, Checkland 2009) where a 'rich picture' is drawn containing *all available information*, including non-technical issues like personal motivations, animosities, power plays etc.

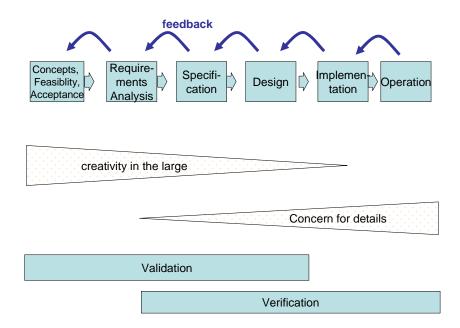


Fig 3 Basic design cycle.

The diagram (Fig. 3) also indicates the lessening influence of creativity with respect to the whole system in favour of more attention to technical details and the need for performing quality assurance activities in parallel. Initially the validation actions are concerned with the question "it this the product we need?". Later verification activities will be pose the question "is the system built in the right way?" Various methods are available there.

For the issues discussed in Team 4 only the very early phases of the design process were of focal interest. We approached the development of a systems design by pooling descriptions and ideas relating to different methodologies with which we were familiar. These included: Ackoff (2001), Beer (1989), Checkland (1981, 2009), the UK Open University Hard System Methodology (2003), and Vester's Sensitivity Model (2007).

We concluded from this review that no single systems methodology would provide the complete answer. There are many individual techniques that we might draw on e.g. rich pictures (Checkland, 1981, Checkland 2009).

It is important to stress the differences between what we now suggest for Integrative Systems Engineering (ISE) and current SE-practice. The diagram below (Fig. 4) highlights it. An explanation of the key points follows. First, we start an overall description of the diagram.

The column on the left shows the real world that exists or is changed by development of new, or enhanced, practice or technology. The right hand side takes us into the world of modelling when a change to the real world is considered by using any problem solving method. As a first step modelling takes place either through observation and scientific measurements, or sampling of comment and opinions. Such gathering of data, such modelling, is inevitably only a partial reflection of the real world. The remaining stages of the methodology take place in the modelling world, until after a decision on the course of action to take, implementation and testing takes place in the real world. A review of the impact of the change in the real world, and measurement of the performance of the new technology, then follows, along with an evaluation of the methodology process.

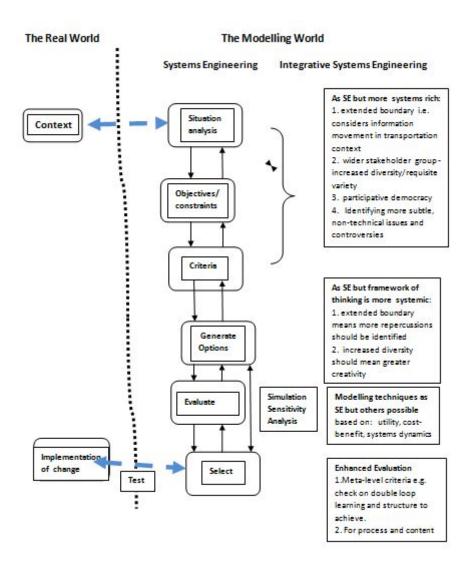


Figure 4 Systems Engineering and Integrated Systems Engineering

The second column shows an outline of the stages in a typical systems engineering methodology. It shows the phases of deciding on the objectives, criteria and constraints, generating options or alternative routes to the objectives, evaluating the options through e.g. computer simulation and sensitivity analysis, making the choice for engineering action and testing/implementation in the real world. The methodology is highly iterative. The methodology is termed "Integrated Systems Engineering" (ISE) because it considers systemic requirements over and above those simply involved in any classical design process (cf. ISO 15288). So, for example, in the case of a project for a new fighter aircraft, a systems engineering approach would necessarily cover issues in-service costs of maintenance, provision and stocking of spares, skills requirements and training needs of aircrew and maintenance engineers. Such a project however, would have a relatively small group of stakeholders, mainly composed of engineers, scientists, the military, manufacturers, and government officials. There would be no need to have the general public as part of a stakeholder group for the design process.

At the right of the diagram we show those aspects which are – in our opinion – key to a systemic approach (see below for more details).

Integrated Systems Engineering (ISE) - Summary of Differences

Though both approaches involve systems engineering, an urban transportation project is very different to developing a new fighter aircraft. This is because it is the public who regularly use the current system who are the experts in that they are likely to be best placed to comment on its shortfalls, be able to identify needs for information which could improve the system, and be able to assess how proposals for new technology may offer benefits and disadvantages. It is for these reasons that a widened stakeholder group is so important.

We believe that our consideration of urban transportation represents a more systemic approach to a complex case study. Another intention of ours is, that rather than just considering the problem of transporting people and goods, we consider the movement/transporting of people, goods and information as one system. Movement of information is itself a significant matter to consider, in parallel to the movement of physical items. Traditionally information is used as means to improve the transport of people and goods, but not considered as item in its own rights, thus, limiting the scope of the systems boundary.

The boxes on the right hand side of Figure 4 give a summary of differences between SE and our recommendations for ISE at the following broad phases of the process.

Problem formulation/objectives and criteria phases

- More attention to diversity of view and requisite variety
- Extended boundary in both:
 - 1. coverage of investigation to include needs for movement of information
 - 2. a widened boundary for consultation with those who use the system, are affected by the system, or are excluded by the current arrangements
- A major attempt to incorporate the user-designer concept, and participative "democracy" into the project process.

We would aim to achieve a "necessary and sufficient" level of diversity in the group until the "point of diminishing contribution" was evident and thus closure on participation could be agreed upon.

It would be our intention to exploit the potential of ICT in terms of the speed of communication and interaction between stakeholders as much as possible which will also be beneficial in addressing the issue of complexity.

Options generation and evaluation phases

As a wider group of stakeholders is involved, the goals/objectives/criteria will have been set with the capability to understand repercussions of options considered across a wider boundary.

While the same range of creativity techniques would be used, a major advantage is that ideas generated, say, during brainstorming or other techniques, would be related to a wider boundary.

The same advantage applies to the identification of constraints and the evaluation of options.

LS commented that using meta-level criteria such as those suggested by Vester would be helpful in evaluating the process. These include to what extent double —loop learning will emerge as the design process develops, and whether a structure exists which could capitalize on the learning. She hoped to consider further and if time allows follow up with a separate paper.

Gerhard commented that designing a new process/methodology is not enough. It is necessary to introduce it to the stakeholders, which is often not an easy task (Chroust, 2002).

Once established one has to observe with what competence the processes are actually enacted.

From the field of software engineering a wealth of evaluation methods for assessing the capability of an organisation to perform a given predefined process (Humphrey, 1989, ISO15504, 2004). This can be used as a criterion for the ability of this organisation to produce quality product (or solutions) in the future, in our case a reasonable, well balanced system. and thus acceptable to the users.

Thoughts On Emerging Technology

Largely due to lack of time, but also the boundary of the Team's technical expertise, most of conversation was focused on systems thinking around the issue of urban transportation rather than the potential of any specific emerging technology. However, we recognized that in some urban contexts like Vienna, the two-wheeled Segway, and its four-wheeled development (Segway Centaur (2010)), could have a useful role. For example, a proposal for a public-funded project for Segways to be available for hire at a train station, promoted as means for, say, onward travel to a nearby commercial centre, might interest the Mayor. This project could be introduced using the kind of methodology outlined above. It would provide the necessary context to widen the stakeholder group for extended involvement throughout the project, to widen simulation and evaluation methods, and to test out communication technology e.g. on the rental availability and position of Segway, and their electronic locking and release.

Also, the Team's exposure to the chaos after the disruption to air travel crucially exposed the need for integrated information and communication systems to help travellers. As European airspace unexpectedly closed from 15 April onwards, so websites and other information channels became jammed, and the travelling public had little to go on as to what action they should take to complete their journeys home. The long queues which formed at airline customer service desks for information showed that no plan for dealing with major disruption was in place. Train stations and ferry ports were similarly unprepared. Work is needed on the needs of information to support systems to deal with major disruption of this kind, and the technology to carry this to the end-user.

Conclusion

Urban transportation is an ideal context to consider a more systemic form of systems engineering. Firstly, this is because movement of information, which is usually seen as means to improve the transport of people and goods (in the sense of "logistics"), is itself a significant matter to consider. Thus the movement of people, goods and information should be viewed as one system.

Urban transportation is also an ideal context to begin to develop a systems engineering approach which is more systems rich, as it offers the chance to incorporate user-views and the underlying 'WHAT' in design change. It is the public who regularly use the current system who are the "experts", in that they are likely to be best placed to comment on its shortfalls, to be able to identify needs for information which could improve the system, and be able to evaluate the benefits and/or disadvantages that proposals for new technology may offer. These users, along with others affected by the system or excluded by the current system should be an important part of the stakeholder group, to provide crucial diversity and requisite variety. Such an enhanced stakeholder group will also provide the potential to add greater creativity to discussion, and assess and evaluate proposals from a user perspective. These characteristics, along with additional methods of process evaluation which we have suggested, have caused us to name this enhanced approach Integrative Systems Engineering (ISE).

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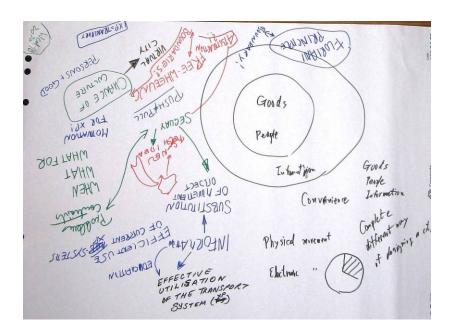
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A horizontal flipchart of Team 4

Discussion Paper (Team 4)	Classifying Problems according to their Design
· apor (roam r)	Gerhard Chroust

M. Lehman proposed a hierarchical classification of software systems (Lehman, 1980, 1985) based on the complexity of their design. It was later extended by Kopetz (1997) and Chroust (2008):

S-System (Specification system): S-type systems address problems that are formally defined and specified. A solution has to fulfil the specifications with no freedom. A typical example is the allocation of number plates to cars, where the rules are clearly stated (uniqueness, legal type and sequence of symbols, etc.)

P-System (Problem system): These systems should solve a problem that is not well-understood or precisely stated, and usually includes some heuristics. Any solution which solves (at least largely) the problem is acceptable. A typical example is the simulation of traffic. The system fulfils its purpose if the predicted traffic flow corresponds to reality.

E-System (Environment system): These systems which interact with the real world (e.g. industrial automation and control systems, embedded systems, etc.) and are strongly affected by the environment. A typical example is the control of traffic lights etc. according to the expected traffic forecasted by the simulation. Drivers very soon at least believe to be able to beat the system by choosing different routes or changing their behaviour, respectively.

W-Systems (Wicked systems): These systems have the properties of E-Systems with additional disturbing properties: they are large and complex, the problem cannot be expressed in a well-defined form, isolating the problem from the environment causes the problem to collapse or to disappear, no termination rule exists; one can always find a still better solution. Additionally *the problem cannot be specified without some concept of its solution* (Kopetz, 1997; Chroust-04). An example for a wicked system is the use of the outcome of the traffic simulation (a P-system) for suggesting (or enforcing) routing of cars in order to reduce both route length and fuel consumption.

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Appendix: What is the IFSR?

The History

A good half a century ago, right after the end of the dreadful period from 1914 to 1945 comprising World War I, the World Economic crisis, and World War II, scientists such as Ludwig von Bertalanffy, Norbert Wiener and their colleagues found a response to the terrible events that killed tens of millions of people: holistic rather than fragmented thinking, decision-making and acting. They established two sciences to support humankind in the effort of meeting this end, which is a promising alternative to the worldwide and local crises. These sciences were *Systems Theory* and *Cybernetics*. System was and is the word entitled to represent the whole. One fights one-sidedness in order to survive. Nevertheless every human must be specialized in a fragment of the immense huge knowledge humankind possesses today. Thus, one-sidedness is unavoidable and beneficial, too. But networking of many one-sided insights can help all of us overcome the weak sides of a narrow specialization. Thus, we all need a narrow professional capacity and add to it systemic / holistic thinking.

From this combination most modern equipment resulted, most modern knowledge in all spheres of human activity, solutions to environmental problems, etc. Most of the remaining problems can be ascribed to a lack of this combination, and there are many around that can hardly be solved without systems thinking and creative co-operation of diverse specialists. Our responsibility for the future obliges us to try to improve the current situation and not to leave an excessive burden to future generation.

The Founding of the IFSR

Since a system, in its general abstract definition, is more than its parts as well more than the sum of its parts, it was decided to interlink groups of system thinkers around the world and to try to find answers to some of the pressing problems of the world.

On March 12, 1980 during the 5th EMCSR-Congress in Vienna the then three important societies in the area of systems research, the Österreichische Studiengesellschaft für Kybernetik, the Systemgroup Nederland, and the Society for General System Research founded the International Federation for Systems Research The key persons were: Robert Trappl, George J. Klir, Gerard de Zeeuw. They became the first officers of the IFSR.

Strong support came from the then The Austrian Ministry of Science and Research in the person of Norbert Rozsenich gave strong encouragement and provided financial support. F de. P. Hanika accepted the responsibility of Editor-in-Chief of the Newsletter of the IFSR.

Aims and Goals of the IFSR

The constitution of the Federation states:

The aims of the Federation are to stimulate all activities associated with the scientific study of systems and to co-ordinate such activities at the international level by:

- co-coordinating systems research activities of private persons and/or organizations;
- organizing international meetings, courses, workshops, and the like;
- promoting international publications in the area of systems research;
- promoting systems education;
- maintaining standards and competence in systems research and education; and
- any other means ... [to] serve the aims of the members.

The first Board Meeting (June 1980) defined the Federation's goals:

- **Social Learning Goal**: Strengthen the programs of member societies by their involvement in the program and network of IFSR.
- **Membership Development Goal:** Facilitate (encourage) the development of Systems science in countries in which such programs do not yet exist or are now developing.
- **Synergetic Goal:** Develop implement evaluate IFSR-level programs to meet the purposes of IFSR to advance systems science.
- Resource Development Goal: Identify an inventory of system science relevant resources, acquire those and make them accessible to member societies.
- **Global Mission:** Make contribution to the larger (global) scientific community, be of service to improve the (global) human condition, and enrich the quality of life of all.

Member societies of the IFSR

The IFSR has shown a healthy growth with respect to the number of members. Currently it has 36 member societies, representing scientists from 26 countries on most continents [in brackets the membership number].

ASC: American Society for Cybernetics [7]

GESI: Asociacion Argentina de Teoria General de Sistemas y Cibernetica [5]

ALAS: Asociacion Latinoamericana de Sistemas [38]

AMCS: Asociacion Mexicana de la Ciencia de Sistemas [37]

Asociacion Mexicana de Sistemas y Cibernetica [19]

AFSCET: Association Française des Sciences et Technologies de l'information et des Systemes [11]

ANZSYS: Australian and New Zealand Systems Group [33]

BCSSS: Bertalanffy Center for the Study of Systems Science [41]

BSSR: Bulgarian Society for Systems Reseach [30]

CHAOS: Centre for Hyperincursion and Anticipation in Ordered Systems [28]

HID: Croatian Interdisciplinary Society [44]

GfK: Deutsche Gesellschaft fuer Kybernetik [34]

GWS: Gesellschaft für Wirtschafts- und Sozialkybernetik [12]

GIFT: Global Institute of Flexible Systems Management [32]

Greek Systems Society [14]

Heinz von Förster Gesellschaft [42]

HSSS: Ελληνική Εταρεία Συστημικών Μελετών (Hellenic Society for Systemic Studies9 [36]

IAS: Instituto Andino de Sistemas [26]

IIGG: International Institute Galileo Galilei [45]

IIIS: International Institute of Informatics and Systemics: IIIS [39]

ISSS: International Society for the Systems Sciences [3]

ISKSS: International Society of Knowledge and Systems Science [35]

KSSSR: The Korean Society for Systems Science Research [22]

RC51: International Sociological Association , ISA-RC51 on Sociocybernetics [40]

ISI: International Systems Institute [4]

JASESS: Japan Association for Social and Economic Systems Studies [31]

MSSI: Management Science Society of Ireland [29]

OSGK: Oesterreichische Studiengesellschaft für Kybernetik [1]

Pentagram Research Centre Private Limited [43]

Polish Systems Society [23]

SDSR: Slovenian Society for Systems Research [25]

SESGE: Sociedad Espanola de Sistemas Generales [13]

SGN: Systeemgroep Nederland [2]

SESC: Systems Engineering Society of China [21]

The Cybernetics Society [9]

The Learned Society of Praxiology [16]

The most recent list can be found on http://ifsr.ocg.at/world/node/3.

Officers of the IFSR

The current officers of the IFSR are:

Dr. Gary S. Metcalf	InterConnectionsLLC	gmetcalf@interconnectionsllc.com	
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Dr. Amanda J. Gregory,	Hull University Business School	A.J.Gregory@hull.ac.uk	
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Prof. Dr. Gerhard Chroust	J. Kepler University Linz	Gerhard.chroust@jku.at	

President



Gary Metcalf, USA

Secretary General



Gerhard Chroust, Austria

Vice Presidents









Leonie Solomons, Australia

Many prominent system scientists have been officers of the IFSR since 1980

starting	President	Vice-President(s)	Secretary/Treasurer	
1980	George J. Klir	Robert Trappl	Gerard de Zeeuw	
1984	Robert Trappl	Bela H. Banathy	Gerard de Zeeuw	
1988	Gerrit Broekstra	Franz Pichler	Bela Banathy	
1992	Gerard de Zeeuw	J.D.R. De Raadt	Gerhard Chroust	
1994	Bela H. Banathy	Michael C. Jackson	Gerhard Chroust	
1998	Michael C. Jackson	Yong Pil Rhee	Gerhard Chroust	
2000	Yong Pil Rhee	Michael C. Jackson	Gerhard Chroust	
		Matjaz Mulej,		
2002	Jifa Gu	Gary S. Metcalf	Gerhard Chroust	
		Jifa Gu		
2006	Matjaz Mulej	Gary S. Metcalf	Gerhard Chroust	
		Yoshiteru Nakamori		
2008	Matjaz Mulej	Gary S. Metcalf	Gerhard Chroust	
		Kyoichi Jim Kijima		
		Amanda Gregory		
2010	Gary S. Metcalf	Leonie Solomons	Gerhard Chroust	

IFSR Activities

The IFSR pursues successfully numerous activities:

- Systems Research and Behavioural Science (ISSN 1092-7026), the official scientific journal of the IFSR, edited by Michael C. Jackson, published since 1984
- International Series on Systems Science and Engineering, IFSR's book series, established in 1985, edited by George J. Klir, now published by Springer, New York
- the yearly *IFSR Newsletter*, the informal newsletter of the IFSR (paper: ISSN 1818-0809, online: ISSN 1818-0817), published since 1981, edited by Paul F de. P. Hanika (1981-1985), Robert Trappl (1985), Steven Sokoloff (1986 1994), and Gerhard Chroust (since 1993).
- The IFSR web-site (http://www.ifsr.org) informing the world about the Federation's activities
- the IFSR Fuschl-conversations, taking place every other year since 1982 in Fuschl near Salzburg, Austria, discussing issues of social learning
- Support for other events (e.g. the EMCSR-conference in Vienna every second year)
- Sponsoring a bi-annual Ashby-lecture at the European Meeting on Cybernetics and Systems Research (EMCSR)

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Future Plans

More than ever Systems Sciences are seen as a basis for balancing the divergent needs and interests between individuals and society worldwide, between ecology and economy, between nations of various levels of development and between differing worldviews.

The IFSR commits itself to increase its contributions answering the needs as expressed in its original aims and goals. Some new activities, in line with the needs and the challenges, have already been started:

- The International Academy of Systems and Cybernetics (with Matjaz Mulej as president) provides a forum for persons professionally excelling in research and teaching of Systems Sciences and Cybernetics.
- The Bertalanffy Library: In cooperation with the Bertalanffy Center for the Study of Systems Science (led by W. Hofkirchner) the IFSR will both help to preserve, revive and disseminate systems concepts and knowledge in general and L. v. Bertalanffy's ideas and work on General Systems Theory in particular.
- The International Encyclopaedia of Systems and Cybernetics based on Charles Francois' seminal International Encyclopedia of Systems and Cybernetics. This work will be continued, supplemented electronically as an attempt clarify and reduce inconsistent terminology and semantics in the field.
- Supporting our member societies in organizing conferences and workshops.

The aim of the Fifteenth IFSR Conversation in 2010, held in Kloster Pernegg, Austria in April 2010, was to continue the tradition that had been established in 1980, but with a renewed focus on coordination between the participating teams. The overarching theme for the conversation was how to support and disseminate systems research and education. The deliberations the 4 teams supported the over-all theme in different ways

- systems education and curricula
- learning sustainability of systems
- linking systems thinking to service systems
- system thinking in systems engineering.

The Conversation was able to build on previous and ongoing work within the member organizations of the IFSR. The outcome of this Conversation, while at a high conceptual level, also supports and encourages further practical applications through individual member activities.

The Conversations essentially followed the successful scheme used in earlier Fuschl Conversations as devised by Bela H. Banathy. 28 renowned systems scientists and systems practitioners from 9 countries took part in this 5-day cooperative effort. The outcome of the conversation is summarized in 4 team reports plus several contributed papers. A short description of the IFSR's activities closes the proceedings.

Institute for Systems Engineering and Automation

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