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Lisbon 2010

Euro Working Group
Methodology of Societal Complexity

Volume 21

Dorien DeTombe (Ed.)

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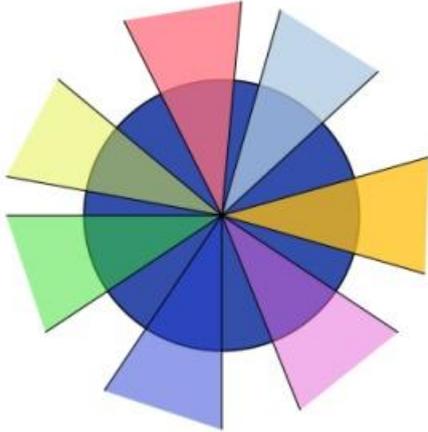
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[The subject of Methodology Societal Complexity](#)

Methodology of Handling Complex Societal Issues focuses on methods and tools for analyzing, structuring, guiding and evaluating complex societal problems.

Complex societal problems are often policy problems that can occur in many fields, like in the Agro-industry (Mad-Cow disease, BSE; Foot- and Mouth disease; Fowl Plague), in the transportation sector, in healthcare (Malaria, HIV/Aids, Flu), in Water affairs and in economy (credit crisis). It focuses also on handling local safety problems like large city issues and natural disasters as flood and hurricanes and global safety problems like war, terrorism. Although many of these issues have different causes, they have so much in common that they can be approached in the same way.

Complex societal problems, as such, are unstructured, dynamical and constantly changing and have a large impact on society on macro, meso and on micro level. Handling complex societal problems needs a special multi-disciplinary approach. The content knowledge comes from content experts. The process knowledge comes from facilitators. The power is in the hand of actors. The attention of the research group is on the methods and tools facilitators need for supporting these kinds of problems. The facilitators use methods specially created for the field of societal problems combined with methods and insights derived from their original field like medicine, law, economics, societal sciences, methodology, mathematics, computer sciences, technology, engineering sciences, chaos theory and operational research combined with content knowledge. Often a combination of methods is needed. In this way the field of societal complexity uses all kind of methods from social sciences and operational research.

The set of lectures focuses on methodology of handling real life complexity with an emphasis on global safety, sustainable development, healthcare, architecture and credit crisis.

Keywords: Methodology, complex societal issues, decisions, sustainable development, global safety, healthcare, architecture, credit crisis



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Chair Dorien DeTombe

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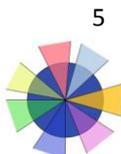
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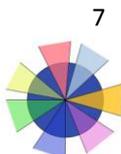
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I COMPLEX SOCIETAL PROBLEMS AND CLIMATE

I-1 Sustainability Assessment For Solar Plant And Wind Power Projects For The Con Co Island, Quang Tri Province, Vietnam¹

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Background: The Clean Development Chemical Programme mentioned in Article 12 of the Kyoto Protocol to the United Nations Framework Convention on Climate Change is a hot issue, in particular in developing countries (e.g. Vietnam). The programme aims to limit or reduce their greenhouse gas emissions. Solar energy and wind power are two important aspects of this programme.

Aim: To assess sustainability as a case study for the planned projects on solar energy and wind power on the island of Con Co, Quang Tri, Vietnam.

Methods: The analytic hierarchy process and multi-criteria/indicator assessment are applied to evaluate the projects.

Results: Scenario I provides the sustainability scores of composite sustainable development index (ICSD: 0.509) for solar energy and wind power (ICSD: 0.490). In Scenario II both power projects score high (solar energy ICSD: 0.86 and wind power ICSD: 0.838).

Conclusions: Multi-criteria indicator assessment was used to evaluate the two projects on Con Co Island. Based on the results of the evaluation, the projects would not only help to reduce environmental pollution but also improve local life, especially in Con Co as a poor island and important district of the province of Quang Tri. In addition, the evaluation may make the decision-makers better able to understand the values of the energy systems as part of a Clean Development Mechanism.

Keywords: sustainable development, clean development mechanism, sustainability assessment, analytic hierarchy process, solar energy, wind power.

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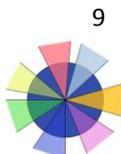
I-2 Online Web Based Solution For Environmental Sustainable Development

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The world has been suffering from the tremendous changes for two decades by means of social, economical and environmental changes with the development of industry. Since the beginning of the Industrial Revolution, the concentrations of most of the greenhouse gases have increased. For example, the concentration of carbon dioxide has increased by about 36% to 380 ppmv. Environmental Sustainability which is the 7th goal of the Millennium Development Goals (MDGs) of the United Nations Development Program (UNDS) has the critical role for other goals to be satisfied. Natural resources constitute the 26% of the wealth in poor countries. In developing countries, most of the diseases are related with the environmental risks. Pneumonia is the most common reason of the 5-6 year old children deaths when it is compared to other respiratory diseases. Thus, sustainable development of natural resources will help to decrease the poorness, diseases and child deaths. Greenhouse gas emissions play an important role in environmental sustainable development. In Kyoto, the developed countries compromised to reduce the emissions of carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) by 6-8% in the period 2008-2012. CO₂ is the strongest gas which contributes 9-26% to the green house effect. The United Nations Framework Convention on Climate Change (UNFCCC or FCCC) aims to stabilize the greenhouse gas concentrations in the atmosphere. The countries who signed this protocol committed to reduce the carbon dioxide and also the other gases causing the green house effect (or in case they are not able to do it), they compromise to increase their carbon credits by the carbon trading. Kyoto protocol allows CO₂ emissions on condition that the countries will pay the cost of excess CO₂ emissions which leads carbon trading. Thus, it is crucial to invest on projects that reduce CO₂. The aim of the multidisciplinary research in this study is to help reducing the green house effect by constituting an online web solution with a mathematical programming approach which calculates CO₂ emission and evaluates the necessary number of trees to recover CO₂ emission, and further calculates the area needed with respect to the region and the type of the tree by the help of Integer Linear Programming (ILP). The necessary number of trees is calculated considering the CO₂ emission from foods, fuel oil and electricity. The overall optimization model consists of minimization the cost of trees subject to the linear equality constraints derived by the total CO₂ emission and the total area occupied by trees. Here, our problem contains 11 integer variables (number of trees) and 2 constraints. The algorithm finds different solutions according to the types of trees growing in a particular region selected by a user, e.g., company among 7 regions in Turkey map. This work not only offers a cheaper web based online solution to carbon trading but also finds solutions to reduce CO₂ in the atmosphere.

Keywords: sustainable development, environment, web



I-3 Eco-dimension of Tourist Service Quality **Majda Bastic**

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Tourism has not only contributed to increase of service export but also to climate changes. Climate changes and their impact on a quality of our life emerged a new increasing segment of tourists who demonstrate a particular sensitivity to the environment. An eco-component has not been included in the existing scales such as SERVQUAL, SERVPERF or ECOSERV. The objective of this paper was to investigate the service quality expectations of the ecotourists in order to develop eco-scale refers to environmentally responsible.

Keywords: sustainable development, environment, tourism

I-4 Compram Method for Handling Societal Problems - Case Study in a Brazilian Research and Development (R&D) Program for the electric sector

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At the Brazilian Electricity Regulatory Agency – ANEEL, SGAN 603, Bloco J, 70.830-030, Brasília-DF, Brazil regulate investments made by companies in R&D Program for the Brazilian Electric Energy Sector. This Program was created by the law 9.991 of 2000 and its funding comes from a percentage of customer's invoices. Nowadays, about two hundred utilities must apply in R&D projects. Based on the utilities' net operational incomes, the annual obligatory investment reaches about US\$ 200.000.000,00 (two hundred million dollars).

Despite of Brazilian electrical sector context is, in a certain way, stable, considering that there are no major changes in the market and technological demands, resulting in a relatively low interest in research by the utilities, the government policy points to technological improvement, more efficiency and energy quality. In this context, ANEEL needs to balance different and sometimes opposite interests.

A new set of rules and guidelines was published by ANEEL in 2008, R&D Manual, in order to improve the Program results. Despite of the public discussion that has preceded the Manual announcement, it has been criticized because utilities' R&D investments are accepted only if project's outputs are original, relevant and can be implemented in a certain domain. Otherwise these investments must be paid with utilities' funding.

Established the big picture, the main problem is to reduce the utilities' R&D financial risk as they develop research projects and at the same time reduce bureaucratic procedures, specially to the



expenditures control. More control means less risk, but with more transaction costs. Lots of others variables increase the complexity. For instance, amplify the use of developed technologies stimulate new research centers and so on.

The Compram Method proposes that problems must be handled cooperatively. It also offers tools, like the seven-layer communication model, to join the stakeholders, describe the problem and looks for solutions. The Method will be applied in 2010's first semester as an attempt to deal with the complex social problem described.

Keywords: Compram Method, societal complexity, electricity.

I-5 Climate Change: A Complex Societal Process; Analysing A Problem According To The Compram Methodology*

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In this lecture some issues about the theory of societal complexity are explained: what are complex societal problems and how should these be handled. The problem of climate change is used as an illustration. The Compram methodology is a methodology based on the theory of societal complexity that gives guidelines to handle real life complex societal problems such as climate change. Handling according to the Compram methodology supports defining and changing a complex societal problem in a sustainable way. The focus of the methodology is on the relation between the steps in the Compram methodology and the problem-handling phases.

Keywords: theory of societal complexity, Compram methodology, climate change.

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II COMPLEX SOCIETAL PROBLEMS AND CITY/ECONOMY

Chair Dorien DeTombe

II-1 The Identity Of A City

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Concurrent remembrance and oblivion are both standing components of all the discourses of our culture, that more or less openly refer to present-day situations and existential experiences. The interest in them rises and falls in various areas of culture but the reflection on history never ends; on history that is our history – something that goes beyond the history written by the historians.

The urban space is a multistratified and multifunctional mirror of the present; the urban architecture constitutes a visualization of key problems of each epoch.

Architects and town planners with increasing awareness engage in the debates that take place at the borderland of contemporary philosophy, aesthetics and new media studies. The focus of the debate and the declarations made by the various parts concern the issues that are of a fundamental significance for them. They have necessary experience and can enrich the debate with some interesting arguments formulated in their own language.

This paper will be concerned with the event considered as a creation of new opportunities for experiencing urban space; with the transition from the concept of a city as a static entity to the vision of a city as a kinetic entity. The main shift in thinking of town planners and architects, inspired by the theories of physicists and philosophers, consists in the belief, that apart from the flow of people and images, also architecture is a kinetic component of the city; that it is the event – and not form or style – that is the basis for thinking about architecture. In architecture considered as an event taking place in the urban space there disappears the distance between the building and its resident; they become a part of each other.

Keywords: architecture, city

II-2 A Multivariate Study Of Social Change In Canterbury

Aijie Xie and Cecilio Mar Molinero

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In 1979, a new government in the UK decided to allow tenants of council houses to buy their properties. Many took up mortgages and bought their houses, only to be caught by increased



interest rates, and were forced to sell the houses they had just bought. This resulted in many social changes in urban areas. In this research we trace the changes that took place in Canterbury using the 1981 Census (before the changes), the 1991 Census (during the changes) and the 2001 Census (after the changes). We use three-way scaling techniques combined with regression analysis to deal with a large and complex data set.

Keywords: city, social change

II-3 Why Bubble Economy Occur and Bubble Economy Destroy

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While the prolonged recession Japan has experienced during the last fifteen years adversely affects general consumers, the phenomenon also presents significant difficulties within the study of economics. Macro-economics was born from Keynes' principle of effective demand applied during the Great Depression, a prolonged slump that originated in the US eighty years ago. It is the position of this paper that Japan's Heisei recession and the US sub-prime loan crisis have revealed a new fundamental economic truth, one at least equivalent to Keynes' theory.

This discovery is termed the "primal problem and dual problem in macro-economics", a version of an expression quite common in OR (Operations Research). The introduction of this concept into conventional macro-economics establishes a tidy system, since the primal problem and dual problem in linear programming can embrace several important factors developed independently since the 1930s.

In brief, there are two different phases in economics. These are the primal and dual problems. In the primal problem phase, capital expenditures of private corporations grow, creating an impetus towards the maximization of profits (the spirit of capitalism, as explained by Max Weber). In this case, as Adam Smith once wrote, the "invisible hand of God" works to lead the economy to a significant growth.

However, once every few decades a bubble economy pops up in a complicated web of dreams and desires in the private sector, and eventually bursts. This is when the economy enters the dual problem phase. With this, the value of property purchased on credit during the bubble period collapses, and the efficiency of investment drops below the market interest rate for corporations with debt. As a result, as described by Max Weber, corporations stay away from capital expenditure and aim to minimize debt rather than maximize profits. In other words, during the dual problem phase in macro-economics, the goal of corporations shifts from maximization of profit to minimization of debt, leading the economy to shrink.

This paper defines the concept of Economic Growth, Bubble Economy and Destruction of Bubble Economy. And this paper describes that why bubble Economy occur and Bubble Economy Destroy. In the process, the paper shows that Primal Economy exists before Bubble Economy and Dual Economy exist after Destruction of Bubble Economy.

Keywords: economy, credit crisis



III COMPLEX SOCIETAL PROBLEMS AND STAKEHOLDERS

Chair Estrellita Lins

III-1 Multi-Actor Multi-Criteria Analysis (MAMCA) As A Means To Cope With Societal Complexity

Klaas De Brucker and Cathy Macharis

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In this contribution it will be shown that the dynamics of stakeholder management, in combination with the implementation of MCA, can be used to cope with problems of societal complexity. A number of approaches to achieve this objective will be discussed.

A first approach to deal with this issue is to design a traditional value structure, i.e. a criteria structure identical for all stakeholders, but whereby each stakeholder is given the possibility of entering his/her individual preferences through specific weights (as in conventional sensitivity and scenario analysis) (see De Brucker, 2000 and Macharis et al. 2006).

A second approach is to design a value structure that – as a whole – is not necessarily shared by everyone. Here, a different module in the overall model is constructed for each stakeholder, whereby all criteria contributing to the objectives of that specific stakeholder are clustered together. This is the ‘multi-actor multi-criteria analysis’ (MAMCA) approach (Macharis, 2000, 2004, 2007). Under this approach, a ‘layer’ that includes the stakeholders is added to the traditional MCA model. Each stakeholder group can then assess the different alternatives in terms of its own objectives/criteria.

Within this second approach, a variety of alternative methods for structuring the value tree can be identified. The use of these alternative methods is particularly relevant for the issue of coping with societal complexity. For instance, the method that was followed in the IN-SAFETY project (Macharis et al., 2008), consists of identifying one central stakeholder (e.g. ‘society/authorities’) corresponding to the public policy point of view, next to two other stakeholders (e.g. ‘users’ and ‘manufacturers’). The intention of the MAMCA, in this case, is to focus in the first place on society’s priorities in order to contribute to the interests of the whole of society rather than those of only one party or stakeholder. The priorities derived in terms of the two other stakeholders’ (users and manufacturers) objectives are then used to test to what extent the priorities of public policy makers are in accord with (or at least compatible with) those of the other main stakeholders. In this case stakeholder interests are considered an instrument either facilitating or obstructing public policy.

Another method within the MAMCA approach is to identify a number of stakeholders without focusing on the priorities of one central stakeholder (corresponding to a public policy point of view). An MCA is then implemented (and priorities are derived) in terms of each separate stakeholder’s point of view. Stakeholder points of view may then be given a weight. In that case, it is theoretically possible to calculate an overall ranking (i.e. in terms of an overall point of view) e.g. by giving equal weights to the stakeholders’ objectives. However, it is also possible to focus on each particular stakeholder point of view. This means that an overall ranking is not formally



calculated (i.e. stakeholder objectives are not weighted). Yet another method is to calculate the overall ranking (by giving equal weights to stakeholders) but to consider this merely a mathematical construct to be used merely for exploring how much (or how little) the separate stakeholder priorities diverge from this mathematical construct. Here stakeholder priorities are used to learn from each other in order to evolve to a possible consensus among stakeholders.

In this contribution the advantages and disadvantages of the above-mentioned approaches and methods will be discussed in more detail. They will be illustrated with results from real-life case-studies, such as the IN-SAFETY project and other projects.

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Keywords: MCDA, MAMCA, stakeholder



III-2 Systemic Intervention - Methodological Pluralism in Managing the Problem Situations

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In contemporary circumstances, problem situations are characterized by high complexity, dynamics, interactivity and many different stakeholders with various interests, values, ends and means of their achieving. Therefore, a creative dealing with problem situations in organizations implies to think about boundaries of analysis, i.e. to judge about what - as important - should be included into consideration, and what - as less significant or irrelevant - can or may be excluded from the research process. Since no view of the problem situation can ever be comprehensive, the boundary concept becomes crucial. Where exactly boundaries are set and what the values manage the boundaries setting, will determine how issues of the problem situation are seen and what actions will be taken during intervention in the problem situation. Setting the boundaries defines both the knowledge to be considered pertinent and the people who generate that knowledge.

As a theoretical, methodological and applicable systems approach to creative, critical and pluralist managing the problem situations, Systems Intervention has developed within critical systems thinking.

Systemic Intervention is based on the ideas of *process philosophy* and the *theory of boundary critique*. Process philosophy makes assumptions about the analytical importance of process of making boundary judgements and the need for theoretical pluralism. The theory of boundary critique deals with the key relationship between boundary and value judgments made by an agent (an individual, a group, an organization, a society).

The resulting *methodology* for systemic intervention is focused on three main activities: *critique* - the agents have to reflect critically upon, and make choices between, boundaries; *judgment* - the agents have to make choices between theories and methods to guide action, which requires a focus on theoretical and methodological pluralism; c) *action* - the methods have to be implemented to create - at least local - improvement in the problem situation.

As part of the methodology for systemic intervention, the *Creative design of methods* provides a strategy for selecting, designing and mixing methods during intervention. The Creative design of methods involve the development of a dynamic set of systemically interrelated questions, expressing the purposes of the agent(s) for intervention that evolve over time; each of these questions/purposes might require to be discussed employing a different method, or part of a method. A synergy is generated that allows a whole system of purposes to be addressed together.

Keywords: Systemic intervention



111-3 Dialogical Self, Theory Of Mind And Meta-Cognition As A Contribution To The State Of The Art In Modeling And Validation

Marcos Estellita Lins, Renato Fernandes, Leonardo Pessoa, Angela Cristina, M. da Silva, Daniel Braga Areas and Milena Estanislau Diniz.

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Validation is important to applying formal models to complex societal problems since unwitting pre-decisions reflect issues that are left out of the research, and can be crucial to the validity of the research. This work proposes the use of concept or cognitive maps to express complexity and conflictive nature of the social problems. We have borrowed multiagency concepts from Dialogical Self theory and Theory of Mind in order to provide a phenomenological support to Problem Structuring Methods. Looking at the big picture helps promoting outside validity. Some applications are provided.

The wider scope of this work arises from openly thinking OR and MS, as we become aware of *a priori* constraints over the adopted perspective. This has been suggested under several disciplinary approaches. We take two of them, namely soft OR and Cognitive Task Analysis, to illustrate challenges that arise from integrating different scopes and perspectives.

According to Pidd (2003) “a model is an external and explicit representation of part of reality as seen by the people who wish to use that model to understand, to change, to manage and to control that part of reality”. Though good models are appropriate simplifications of the (always) complex reality, it is not an easy task to specify what are the appropriate features that need to be represented in the model, unless it is detached from reality.

Validation is almost a taboo when it comes to applying formal models to complex societal problems. According to DeTombe (1998), unwitting pre-decisions reflect issues that are left out of the research, and can be crucial to the validity of the research - what she calls outside validity.

This work proposes the use of concept or cognitive maps to express complexity and conflictive nature of the social problems. We have borrowed multiagency concepts from Dialogical Self theory (Hermans and Dimaggio, 2004) and Theory of Mind (Malle and Hodges, 2005) in order to provide a phenomenological support to Problem Structuring Methods. Looking at the big picture helps promoting outside validity.

Some applications are provided, both in health and infrastructure sectors. The first aims assess potentials to improve procedures in the surgical center at the University Hospital of the Federal University of Rio de Janeiro using cognitive maps and simulation. The later deals with performance assessment of container terminals worldwide using cognitive maps to help structuring a Data Envelopment Analysis model.

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Keywords: Meta-Cognition

III-4 The Annotation Model For E-Democracy Debates

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Problems encountered within the e-democracy are closely related to the web 2.0 phenomenon. One objective of the e-democracy is the opinion construction and/or extraction on the web to support a political decision. One efficient way is to have citizens debate on subjects or texts. The first issue is the analysis of the produced content, the second one is to improve the participation. Being able to manage the flow of generated data, models and tools become a necessity. In this paper, we present the "Annotation" as a practical and effective model on which we will base our argument.

Keywords Complex Societal Problems, Decision Analysis, Group Decision Making and Negotiation



IV COMPLEX SOCIETAL PROBLEMS AND EDUCATION

IV-1 Religious-Political Conflict Resolution*

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This paper uses Nomology, the science of the laws of the mind, to explain Religious-Political Conflict Resolution, in terms of an Adapting system, aspects of which include Body, Mind, Soul and Spirit. It suggests that people of all religions and none will have to do a lot of “soul-searching” before progress can be made to reduce the causes of religious-political conflict. The paper endorses the direction of the discussion about the separation of church and state that took a path from Hegel to Rawls, to Habermas, and uses the meta-framework to propose where the discussion should go in the future. It suggests that this will involve cooperative inter-religious examination and challenging of religious texts.

Keywords: systems methodology; Nomology; decision science; philosophy.

IV-2 Basic Social Math

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In order to establish a new perspective that can foster innovation in the management sciences, better tools are needed at the fundamental level of math that is used for social analysis. This project seeks to consolidate principles and techniques used in the more sophisticated quantitative methods of Operations Research and extend these tools downward to their fundamental, but still rigorous, level where they cross into the linguistic frameworks that are used to interpret and understand data in managerial, financial, and educational systems.

* Also published in Dorien DeTombe, Cathal Brugha, Gerhard-Wilhelm Weber, Fred Wenstøp (Eds.) (2010) State of the Art Workshop LISBON Operational Research Volume 22. Greenhill & Waterfront, Amsterdam,



V COMPLEX SOCIETAL PROBLEMS AND MISCELLANEOUS SUBJECTS

Non-attendees

ARCHITECTURE

V-1 A Friendly City

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What is the best place to live? If we could ask, most of people will chose a single-family home on the suburb with garden and etc., not too far from a job and an service. (stereotype)

Statistics and prognosis show us, that in the future numbers of city dwellers will grow up.

Most of people will live in the city. They will changing home a few times per life (manly from economical reasons). If somebody need to chose, where to live, he will. Attractive city, district, housing estate, nice flat or view and a friendly environment is the answer. Cities rival between each other to be the best, and to attract a capital.

Sustainable development is the way how to also develop a city area.

A representative city of Paris invite some of greatest architectural and urban theoreticians to take part in competitions – how Paris will looks like in the future. They need to find solutions for many social and others problems. On this summer at exhibitions were presented visions of *great Paris* developed by greatest theoreticians.

An Eco Compact City (ECC) present the way of develop structure of cities, which arise from *sustainable development*. A homogeneous structure of a district in the city can help to reduce communications and time, etc. (everything what I want, I can find in the neighborhood).

Public spaces influence on quality of living spaces, and produce interactions in city community. A modern high educated city collective cannot exist without culture. A city should deliver also places to express yourself, to play with art or others over existence human needs to generated vitality in life.

There are lots of aspects in *sustainable development* : social, urban, esthetics, health, culture etc., which influents on a friendly living places for us and future generations on the Earth.

Keywords: city, sustainable development



V-2 Residential Environment Quality And Sustainable Development , Based On Sample Cities

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According to the Athens New Chart, the city of the future is a specified area whose development is determined by the principles of sustainability. Its essential function is to improve the quality of life of present and future generations. What is conducive to this function is the residential environment meant as a place in which the human being has a possibility of fulfilling his ambitions and life plans. It is also a place that should provide human community with various services

The aim of the paper is to present research on the evaluation of residential environment, conducted in three Polish towns: Jarosław, Łańcut and Przeworsk and a Slovak town – Levoca.

The factors analysed included privacy and quiet, contact with the natural environment, safety, harmony, availability to basic facilities, multi-functionality. These aspects were covered in the first group of research (sociological) – carried out in surveys and direct interviews with citizens. The questionnaires were conducted only in the Polish cities, with approval of the cities authorities. The direct interviews were analysed using mathematical statistics.

The other part of research covered town-planning analysis. To perform it, the central zone was divided into four areas. Area I included the centre proper, area II is composed of neighbouring localities. Areas III and IV are located on the outskirts of the central zone.

In the centre proper (area I) the environment investigated is a compact historical development – tenement houses facing the public space– mainly the market square. The residential building also accommodate the services function, i.e. shops, cafés etc. on the ground floor. At the back of the development quarters there are backyards, used basically by the residents of the building complexes in question.

Area II is also composed of historical buildings, the 1920s – 1930s, approximately. Within its boundaries there is usually a park, or a smaller greenery place of public character. Area III is built up with large residential complexes – multi-family houses (blocks of flats). Area IV is the area of detached houses surrounded by gardens.

In all the analysed areas two surveys were conducted. They were a basis for the evaluation of: contact with nature, common space management (backyards, squares and streets), mezzo-climate (temperature variation, air humidity, insolation, ventilation hygiene).

In the second and third questionnaires the respondents evaluated the availability to services, utility programme of green areas and playgrounds, the size of backyards, view from the window on natural elements, presence of elements of nature, privacy and quiet.

The town-planning analysis was complete with geodetic survey and photographic documentation. Its aim was to assess the pro-health conditions (availability of recreation facilities and green areas), psychic and mental well-being (building structure and interior scale), a sense of community (categorisation of space into private, community and public sectors).

The paper will include detailed results of the research for only one of the towns (due to extensive analytic material) and conclusions of the analysis for the other ones. The results and their analyses



made it possible to make a comprehensive evaluation of the sustainable development conditions fulfilled by small-size Polish towns in sub-Carpathian region (Jarosław, Łańcut and Przeworsk) and a Slovak town of Levoca. They also enable certain generalisations together with recommendations as to the improvement of residential environment quality in the era of sustainable development.

Keywords: city, sustainable development

V-3 The Small Towns Development Strategies and Instruments Based on the Utilization of Local Natural and Cultural Heritage

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The paper is focused on complex societal problems – the question of development of small towns and provincial settlements in the conditions of economic globalization.

The small towns are an important part of social and economic relations, as well as of the cultural heritage and natural environment of Europe. Many of their original functions vanish per consequence of globalization and small towns are declining. In such reality, there are also some examples when the process of declination was reversed by the local policy of utilizing their natural and cultural heritage. The local natural and cultural heritage, in that case, there is a source of potential for next development.

From the sustainability point of view, the heritage is a very fragile and non durable societal phenomenon. It needs to be protected. The heritage values identification and the quantification of their qualitative aspects that are the prospective way out so for the heritage preservation as well for the development of touched territory. The heritage values preservation is frequently realized by means of conservation of existing status, but the development scope is presented as a quantitative growth. These two processes often act competitively and contra-productively. For the sustainable development of small towns and their cultural and natural heritage is needed to find out a policy instrument that them brings into mutual harmony.

The contribution will present a method of digital territory plan with inserted elements of intelligence. Such plan has multi level configuration with elaboration of much information from different fields of society. By its internal cooperative links, it enables to guide the processes of heritage preservation and of local/territorial development also by simulation, too. That can be used as an effective handling instrument for presented complex societal problems.

Keywords: city, local natural and cultural heritage



CREDIT CRISIS

V-4 In Search Of Alternative Solutions To The Global Financial Crisis And Joint Decision-Making Problems

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The world is experiencing a new era of interconnectedness widely known as globalization. Although there have been other similar periods in history, the term globalization started to be used specially after 1980s. Globalization has transformed the world, brought opportunities and threats at the same time. These opportunities and threats are particularly related to the dramatically increased mobilization of capital. Since one of the most critical obstacles for emerging economies in the process of economic development is the shortage of capital for investment, this new situation seemed as creating a “life ring” for these economies, although this makes them dependent on capital surplus of other countries. However, many have ignored the simple fact that this capital can hardly be used for investment. Because the term of about 80 percent of these inflows has been shorter than one week and they can change their direction in any second. Thus, it was soon started to be realized that this capital was too mobile to be useful for investment and it was more likely to be a recipe for financial disaster for the ones who use it for investment. Nowadays, most people would agree that extreme mobility of capital has become the most important reason for financial crises to occur.

Despite all these foreseeable hazardous effects of capital inflows, the international organizations, like IMF, World Bank and WTO urged emerging countries to liberalize and deregulate economic activities and privatize public sector enterprises. In this process capital controls, which is particularly important for the aim of this paper, were abolished. This change appeared as beneficial for capital rich countries. Because profits had declined substantially since 1970s and earning handsome interest rates seemed as the way out. Limited numbers of developing countries that could establish a formidable and low cost production base were among the beneficiaries of globalization, since it became possible for them to sell their products to a much larger market. The beneficiaries of globalization, like China and India, could improve their welfare level significantly. On the other hand, those countries which could not handle the risks of globalization faced with severe financial crises and paid very high social and economic prices. The financial and economic crises caused massive unemployment, poverty, misery and deep social conflicts. In the last two decades, many countries whose economical and social structures are completely different from each other confronted with financial crises. Until the 1990’s, every crisis belonged to the country where it had happened. However, since then, because globalization improved the interactions and dependences among the countries, with the domino effect, the crises affected the surrounding countries and even the countries which had no geographic relationship. Besides, although until the 1990’s financial crisis was considered as a problem of emerging economies, with 2007 Global Crisis, it was very well understood that, even developed countries can face with it and suffer from its deep harmful effects.



After all these bad experiences, financial crises have become a common global problem and nowadays, the importance of global prevention from financial crisis is getting more important to protect global financial architecture. Furthermore, recasting global financial architecture is being told out loud. A new global financial architecture is highlighted in every conference or congress which is held about global economical problems. Especially restructuring international organizations, like IMF, finds acceptance. Creating a certain fund in IMF to prevent financial crisis also can be considered as an alternative solution. In this regard, there are different alternatives which can be considered as resources: Tobin Tax, Two-Tier Spahn Tax, Pigovian Carbon Tax, and Internet Tax are some of the alternative global taxes for the fund. Apart from these, every country can apply capital controls (either on inflows or outflows with different effects) to reduce volatility of financial and economic activities. However, there may be great conflicts among the countries in reorganizing process. Some of the countries may put pressure on the others to control the process. Some others may plan to exploit the benefits of the new structure as a free rider or it may be hard to convince them to participate in joint-decision process since they want to stand up for themselves. Even some of them may prefer not to levy the global taxes which were mentioned above to turn the direction of the global trade towards their country.

In brief, this paper aims to overview some of the joint-decision making problems and analyzes in detail some alternative solutions to deal with them. The paper will also look for the type of financial architecture that would benefit all and will propose a joint-decision making process which will not be counter productive if not synergetic.

Keywords: Global Public Goods, Global Financial Crisis, Joint-Decision Making Problems, Free Rider, Prisoner's Dilemma, Global Taxes, Capital Inflows

V-5 One Of The Drivers

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One of the drivers to/of Societal Complexity is the role of money and - associated to it, in an unfortunate liaison - greed, power, dishonesty and other affiliated "unsocial" behavior.

The Civil Engineering Construction Industry (CEC) frequently hits the news with discrediting reports on its ethical performance in business.

No apparent effort however is invested in changing the underlying, systemic causes, namely: awarding contracts to the "cheapest" tenderer (in public procurement) and, speculative pricing (to gain higher return without employing additional resources, or to cover risks).

The existing legal basis of the system of contracting rather fosters, contractors having to profiteer out of defective design or, defective/imperfect description of the works or, "change" of conditions - all in an effort to be (in the end) paid an economically required revenue.

Claim management is the faux-pas-word for this, creating an atmosphere of mistrust, envy and "truckage" (as the French say).

Another aspect relates to political & national economy in as much as, labour is a non existing item of payment in the relevant schedules of rates. Unemployment however, at the same time is an



unfortunate and well acknowledged fact in many if not all national economies. No effort is apparent to cross the two subjects in a system of compensation for works (in CEC), being the only systemic remedy to the problem.

One of the potential solutions which should be researched across the faculties could consist of the following, namely:

- that all Clients should be certified regarding their legal, commercial, technical and managerial capacities before entering construction projects (Contractors are obliged to conform to these obligations already now).
- If Clients do not conform or don't want to rig respective internal resources, they should be obliged to equip themselves with appropriate and coordinated external resources (Quality assurance).
- The above certification would create the basis for contracting between "educated" partners and thus, provide the possibility to also apply different/new modes of compensation, which would also more appropriately attend to allotting of risks. The latter being one of the sources of speculative pricing (Tenderer), or camouflaging risks in lump sums (Owner).

The risk of building in general, still is to be assumed by the owner. Incalculable risks are not to be transferred without appropriate compensation (...an uncommon insurance aspect).

One of such modes of compensation (for CE works) could be (and has proven to function satisfactorily in practice), to pay for time related and production oriented items in a specifically balanced way. Decisions on deployment of resources in this system (requiring such "educated" partners) are taken jointly.

Labour intensive solutions could be supported at the same costs as other competing solutions. This would provide an important socio-political aspect, as national economies consist of up to 10% of spending for civil engineering construction.

Working title for such a system reportedly is "StilfOs" (originating from tunneling/mining), and has reached literature (TU Graz, Institute for Construction Methods and Economy). More and other methods could evolve during research.

Keywords: credit crisis, industry

V-6 Towards Computer-Aided Collective Bargaining: Enhancing The Trade Unions Position Under Flexicurity¹

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The paper develops a negotiation model for flexicurity-relevant collective bargaining. Flexicurity is a European labour market policy which should compensate the ongoing flexibilization of employment relations by advances in employment security and social security. Flexibility is promoted by employers, whereas trade unions are concerned with security. First, the opposite interests of negotiating sides are expressed by indicators which evaluate flexibility and security aspects of a collective labour agreement (CLA). A fair agreement should have 0-balance, by analogy with credit-debit 0-balance in finances. Since the flexibility and security indices are



expressed in different scales ('in different currencies'), the substitution rate ('exchange rate') should be determined. In our case it is done by regression analysis of flexicurity-relevant CLAs from the past practice. The data are taken from the Dutch computer archive of about 5400 CLAs in years 1995–2007. For a given CLA, a positive deviation from the flexibility–security 0-balance means that flexibilization issues are well compensated by security measures (better than on the average). A negative deviation means that flexibility prevails over security, implying that trade unions are disadvantaged.

The model outputs tables and graphics and can be regarded as a kind of interactive check-list. It shows shortages and advantages of a given collective agreement with several indices, and displays its relative position with regard to all reference CLAs considered, to those of the given year, to those within the branch, or within the branch in the given year. Finally, the total evaluation of the CLA is made in terms of so called flexicurity balance. This approach can be easily extended to issues beyond flexibility and security.

Besides pragmatic goals, the study provides empirical evidence of increasing flexibility at the price of security. This is a serious warning against improper implementation of flexicurity and one-sided use of this policy in favour of employers. The computer tool developed is just aimed at enhancing the position of trade unions to the end of surmounting this negative trend.

Keywords: Trade unions, collective bargaining, collective agreements, labour market, flexicurity, composite indicators, decision support.

V-7 Biopolicy – Structure and Methodology in Building a Green Society **Agni Vlavianos-Arvanitis**

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In 1985, after having dedicated twenty years to teaching and research in biology, Professor Agni Vlavianos-Arvanitis founded the Biopolitics International Organisation (B.I.O.) to promote international cooperation and education for the environment. With Greece as its operating basis, B.I.O. has gained wide acclaim by scholars and decision-makers in 137 countries around the world, and has been granted special Consultative Status with the United Nations' Economic and Social Council (ECOSOC).

The spreading economic and environmental crises prove that society can no longer rely on paradigms of the past. Complex societal problems stemming from environmental destruction can be relieved through education, international cooperation and peace. In this context, biopolicy sets as a priority the building of a new value system. Efforts concentrate on a new understanding of profit, on reversing unemployment, and on using life-supporting technology to protect the environment. Efforts also focus on encouraging environmental leadership as a vital tool for inspiring economic and social change.

Biopolicy sets as a priority the protection of the environment and the building of a new value system. The spreading economic and environmental crises are proof that society can no longer rely on the paradigms of the past.

Keywords: Complex Societal Problems, biopolitic



CLIMAT

V-8 Neo-Liberal Civilisation, Climate Change, Sustainable Development And Social Complexity - An Emerging Asian Perspective

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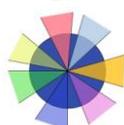
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The climate change talks at the Copenhagen Summit could not achieve its desired objective because the emerging Asian economies like China and India could not see eye to eye with the rest of the developed world. This is more to do with the clash of civilization than undermining the dangerous fallout of climate change. China and India constitute almost 40 per cent of global population and they are fastest growing economies of the world. As such these two economies are emerging as the major polluters of the globe in absolute terms. Unless these two economies join the bandwagon of the rest of the developed world the climate change talks will not succeed.

In the post WTO era, both China and India have got trapped themselves in the neo-liberal development model and through this model of development they aim to achieve all the developmental objectives. Unfortunately the neo-liberal model will only perpetuate the myth of development resulting in irreversible damage to environment. But the prevailing social dynamics in these economies are so complex that alternative workable development model is hard to come by.

The paper attempts to analyse and structure the social complexity of Asia in relation to climate change and guiding and evaluating these complex social problems of emerging Asia in relation to rest of the developed world.

Keywords: climate change, sustainable development



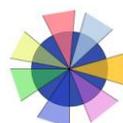
V-9 Dynamics of Technology Shifts in India's household sector Universalisation of Modern Energy Services in India's household sector

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Many environmental programs have financial costs, but no financial benefits. Often this acts as a barrier that prevents the government from implementing environmental improvements. Energy efficiency, on the other hand, has both an environmental benefit and a positive financial return. Improving the energy efficiency of a system has multiple advantages, viz., efficiency of utilisation of natural resources, reducing air pollution levels, and lower spending by the consumer on energy related expenditure. Yet, many governments are not aware that energy efficiency can have far-reaching effects on their country's well being. The consumers' demand for energy efficient technologies is commonly acknowledged to be limited. In India, limited awareness is accompanied by limited motivation, given that energy costs are in the affordable limit. Against this back ground, the present paper provides a methodological framework for the diffusion of energy efficient technologies and estimates the rate of return for the residential consumer to improve energy services and reduce CO₂ emissions. Using the data from the National Sample Survey, the paper documents the energy consumption disaggregated according to end-use activity and also by income group for rural as well as urban households. The data illustrate important differences in household energy consumption which can be attributed to the variations in household income, family size, and price of energy carrier. The study looked at the energy carrier shifts, the general shifts being towards LPG and electricity (60 to 65% efficiency) and away from firewood and charcoal (10 to 15% efficiency). The results show that income plays an important role in the shifting of households from one energy carrier to another. Household size and energy carrier price also play a role, but their effect seems to be small. The paper visualises the naturally occurring shifts (with increasing household incomes) as well as shifts due to policy intervention (from inefficient to efficient technologies) and estimates the technical, economic and environmental potential for improved energy efficiency by 2010 AD. It sets out why households do not at present use the cost-effective technologies available to them – the barriers to energy efficiency, the benefits of innovation for energy efficiency, and the required policies and specific proposals for government intervention.

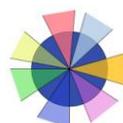
The household sector has grown to one of the largest users of energy in India due increased population and economic activity and development and changes in consumption and lifestyles. Affordability and accessibility to modern energy carriers are the major barriers in selecting fuel for households from rural regions and urban poor. The present paper tries to (i) study existing energy use patterns in the household sector, (ii) estimate the number of needy households, (iii) estimate the economics of providing modern energy services to all (iv) estimate the environmental cost of such universalization, (v) develop a public-private partnership business model in this regard and (vi) suggest an enabling policy framework for implementation. The study has chosen 2030-31 as the target year of universalization and the process has been tracked through scenario construction using data and assumptions. Central to



the development of India's energy policy are questions of the size and economic efficiency of the household energy market. The household sector is one of the largest users of energy in India, accounting for about 30 per cent of final energy consumption (excluding energy used for transport) reflecting the importance of that sector in total national energy scenario. During the past few decades, the Indian household sector has experienced many changes in energy consumption patterns, both in quantitative and qualitative terms. This is due to the natural increase based on population growth and due to increase in economic activity and development. While India's population grew by about two per cent per annum, from 1980 to 2005, the energy use grew by more than four per cent every year. This is due to increased incomes, urbanization and changing lifestyles. More user-friendly household appliances have penetrated rapidly resulting in increased energy consumption. It is natural for people to pursue a better life, which often means increased mobility, proper heating and cooling, and more appliances. The changes in lifestyles induces households shift to technologies that provides greater comfort, for example, firewood → kerosene → LPG. However, all the households can not afford this choice of modern energy services. Affordability and accessibility to modern energy carriers are the major barriers in selecting fuel for households from rural regions and urban poor. Hence, it is important to analyse household energy consumption patterns and study the causalities underlying the fuel/technology shifts. Providing modern energy services has multiple advantages, viz., efficiency of utilisation of natural resources, reducing air pollution levels, and lower spending by the consumer on energy related expenditure. The economic valuation of the adopted technologies is done by estimating the cost and benefits of their deployment. The impact on climate change is also estimated through CO₂ emission accounting.

The paper provides a methodological framework for the universalisation of modern energy services and estimates the costs and benefits to improve energy services and reduce CO₂ emissions. To attain this universal provision a public-private partnership-driven business model, with entrepreneurship at the core, is developed with institutional, financing and pricing mechanisms. This approach, termed as EMPOWERS (Entrepreneurship-based Model for Provision Of Wholesome Energy Related basic Services), if adopted, can facilitate large-scale dissemination and diffusion of energy efficient and renewable technologies and distributed power generation technologies to provide clean, safe, reliable and sustainable energy to rural households and urban poor. It is expected to integrate the processes of market transformation and entrepreneurship development involving government, NGOs, financial institutions and community groups as stakeholders.

A desirable scenario is developed with base year as 2010-11 and 2030-31 as final target year for universal provision of modern energy services and the interim period is divided into four five year plans. The cost estimates of energy empowerment are calculated for both rural and urban areas separately, where the former is higher than the later due to higher deprivation. The annual investment for the four plan periods are estimated to be 93, 93, 102 and 87 billion Rs respectively. The annual CO₂ emission reduction potential is quite substantial at 94 million tonnes (mt) at the end of 2016, which reaches a peak of 458 mt by the end of 2031, when all the households are predicted to have provision of modern energy services. The cumulative CO₂ emission reduction in the entire plan period is approximately 2,300 mt.



This study uses the National Sample Survey (NSS) data of 61st round on consumer expenditure conducted in 2004–05 for estimating the current status of energy usage pattern. The other information required for the scenario development includes: annual energy requirement (for cooking and lighting), CO₂ emission factors, cost of installation of biogas plants, distribution network (laying of pipes, etc.), costs of electricity generation for different technology options, transmission and distribution, and cost of devices. The data for estimating these parameters has been obtained from government reports, catalogues, journal papers and from equipment manufacturers. The capital and the operating costs of supplying modern energy carriers are estimated using the standard discounted cash flow method built in the spreadsheet. More specifically, life cycle costing method is used for economic analysis.

Keywords: India, household, energy



EDUCATION

V-10 Effects of Individual Dynamic Complexity Elements on the Overall Complexity of a Simulation Game

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System dynamics based simulation games are commonly used to assist learning about complex systems. Though, it's unclear whether players can acquire transferrable learning by playing games. The main goal of this research is to assess the extent of learning under different game complexity levels. As the first part of this research, this paper focuses on explaining the overall game complexity in terms of dynamic complexity factors: delay, nonlinearity, stock and feedback. Using a two-stage experimental procedure, a complexity measure is sought, based on player performances and their assessments

Keywords: System dynamics and theory

V-11 Sustainability Of Scientific And Educational Systems In Recent World Alexander Makarenko

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The main recent tendency is the acceleration of transformations. It had been recognized that sustainable development (SD) is necessary. Non-sustainable development follows to a lot of risks and conflicts. Analysis of investigations and publications on the SD leads to the conclusion that the main conflict in non-sustainable systems consists in the distribution on space and time restricted volume of resources. Remark that the investigations on sustainable development have been related mainly with the problems on natural resources and energy. But only now it have been recognized that very important (or just most important) became other aspect of society life – namely KNOWLEDGE. The list of posing new problems and challenges are: the development of knowledge; the knowledge use; transfer of knowledge between generations; spreading of knowledge; reproduction of knowledge bearer (that is researchers, teachers, students) etc.

All this follows to the conclusion that the focus of sustainable development investigations should be shifted to the investigations on science and education as the infrastructure and knowledge source under the globalisation, new challenges and conflicts (explicit and implicit). Besides much more attention should be devoted to considering and anticipation of



new conflicts and risks (especially caused by science and education). As theoretical as practical aspect should be considered.

Proposed report is devoted to the investigations of interaction between society, science and education and to the European aspects of such problems. So, the following problems will be considered:

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- Ukrainian experience in science and education: possibilities and presumable losses

Keywords: Knowledge, sustainable development

V-12 Smartsurfaces

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Dealing with complex social problems requires an approach that transcends individual disciplines. College students learn the basics of their disciplines but they also can learn to transcend these disciplines and deal with complex issues. The Smartsurfaces course at the University of Michigan brings students from three disciplines together to define a problem and create a solution in a collaborative, interdisciplinary team environment. Students from Architecture, Engineering and Art & Design are challenged to create a heliotropic surface as a solution to a problem of their definition. The course was designed to expose the students to other disciplines and to give them opportunities to create in a collaborative environment. The course starts with 4 skill building challenges to expose the students to other disciplines and to provide them with an opportunity to experience and learn teamwork skills. The course also utilizes lectures from design experts to challenge the students to communicate beyond their disciplines. The final project challenges the teams (2 students from each disciplines) to create a surface that changes in response to light and explain how it solves a problem.

Keywords: smartsurface, complex societal problem



V-13 Generalized Nash Equilibrium And Joint Implementation Of Pollution Control Projects

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Smartsurfaces: An Educational Experience Design Dealing with complex social problems requires an approach that transcends individual disciplines. Organizations have tried techniques such as matrix management to get people in different disciplines to work together – but higher education has mostly remained a time for specialization. College students learn their disciplines but they also can learn to transcend these disciplines and deal with complex issues. The Smartsurfaces course at the University of Michigan is such an educational design. The Smartsurfaces course brings students from three disciplines together to define a problem and create a solution in a collaborative, interdisciplinary team environment. Students from Architecture, Engineering and Art & Design are challenged to define a problem and create a solution in a new discipline such as heliotropic smartsurfaces or biomimetic smartsurfaces. The course was designed to expose the students to other disciplines and to give them opportunities to create in a collaborative environment. In this way, it was intended to foster interdisciplinary thinking in the individuals and not just bringing individuals from different disciplines together to form into interdisciplinary groups. The three professors who created the course (co-authors of this paper) responded to a challenge by the Provost of the University of Michigan to create multidisciplinary team taught courses. The call for proposals stated: “In order to prepare for a life of productive endeavor in the 21st century, undergraduates at the University of Michigan must learn problem solving across disciplines and launch inquiries in uncharted territories of knowledge and practice.” This course asks the students to create real world results as a result of making these inquiries. The course starts with skill building challenges to expose the students to other disciplines and to provide them with an opportunity to experience and learn teamwork skills. The course utilizes required readings and lectures from design experts to challenge the students to communicate beyond their disciplines. The communication takes place at the class level, the team level and in small groups or one-on-one. The communications media include dialogs, presentations, , e-mail, blogs, memos and reports. The final project challenges the teams to create a smartsurface. They need to show it as an exhibit, write a paper and do a presentation to the class and invited jury explaining the problem space and solution and showing their smart surface. They are also expected to think and talk about the process of creating an artifact in a new discipline with their team. The students bring the skills and language of their disciplines to the course and must learn to understand each other as they explore and create the new discipline. The students explore what is meant by common terms such as “design”, “smart”, and “surface” which have different meanings in engineering, art and architecture. In the fall of 2010, the students will explore the uncharted territory of “Biomimetic Smartsurfaces” and work together to define and create an artifact in this new realm.

Keywords Education and Distance Learning ,Complex Societal Problems ,Knowledge Engineering and Management, smartsurfaces



EDUCATION

V-10 Effects of Individual Dynamic Complexity Elements on the Overall Complexity of a Simulation Game

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System dynamics based simulation games are commonly used to assist learning about complex systems. Though, it's unclear whether players can acquire transferrable learning by playing games. The main goal of this research is to assess the extent of learning under different game complexity levels. As the first part of this research, this paper focuses on explaining the overall game complexity in terms of dynamic complexity factors: delay, nonlinearity, stock and feedback. Using a two-stage experimental procedure, a complexity measure is sought, based on player performances and their assessments

Keywords: System dynamics and theory

V-11 Sustainability Of Scientific And Educational Systems In Recent World Alexander Makarenko

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V-12 Smartsurfaces

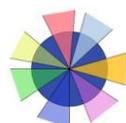
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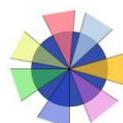
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Keywords: Education and Distance Learning, Complex Societal Problems, Knowledge Engineering and Management, smartsurfaces



V-14 On Education (prepublication-draft article)
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The purpose of this paper is to present a tentative cybersystemic analysis of our Global existential problem as largely the result of three biologically evolved-in human imperatives. And to propose that these imperatives probably can be steered to function to support Global ecological-cultural, and intercultural symbioses, by ICT supported cybernetically informed global in-service transformative teacher education improvements. Teachers should we argue be taught to teach how Good balance between freedom and control, can, we argue be achieved by judiciously applying the law of Requisite Variety to the most important emergent systemic levels in our personal and socio-technical systems. If these conjectures can be more broadly supported and further developed this strategy should be very important for improving education and well being both locally and Globally.

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