Program & Abstracts 2014

Learning across Boundaries: Exploring the variety of systemic theory and practice

George Washington University
Washington, DC

Gerald R. Midgley
President

ISSS Co-Sponsors & Affiliated Organizations

The following organizations have provided various levels of support for the ISSS 2010 conference. All have agreed to publicize the conference through their institutional networks. In addition, those so designated have provided either financial or in-kind support through participation in conference planning and facilitation.

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American Society for Cybernetics

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INCOSE
International Council on Systems Engineering

IASCYS
The International Academy for Systems and Cybernetic Sciences

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Welcome to ISSS 2014

Welcome to the 58th Meeting of the International Society for the Systems Sciences at George Washington University, Washington, DC. In designing this year's meeting I was aware that there are now many thousands of systems thinkers, cyberneticians and complexity scientists worldwide. As more and more new application areas, practices, systems methodologies, theories and philosophies are developed, the number of research communities continues to increase. It is impossible for any individual to keep track of all these communities, let alone the many new ideas they are producing.

Fragmentation is the inevitable result of the proliferation of new systems ideas in response to new issues and contexts. While this might, at first, appear to be a negative consequence of our success, it brings with it an enormous opportunity: mutual learning from each other to enhance systems, cybernetic and complexity theories and practices in all our diverse domains. It is this opportunity that provides the focus for our 2014 conference.

The International Society for the Systems Sciences (ISSS) was founded in 1956 to "encourage the development of theoretical systems which are applicable to more than one of the traditional departments of knowledge". The founders of the society also had a deep commitment to making a difference in practice. Given the fragmentation mentioned above, the mission of the ISSS to generate ideas that can be used in multiple areas of application and practice has never been more relevant than today. This conference will reach out to all the diverse systems communities and provide a forum for mutual learning across their boundaries. If each person coming to the conference brings in just one idea, and also takes away just one, this will be an enormous stimulus to innovation across all our systems communities.

To facilitate learning across boundaries in this conference we have implemented some innovations. Firstly, not all the conference streams are being run by the ISSS 'special integration groups' (SIGs). While the SIGs will still have their own streams (as in previous years), we have also encouraged anyone with an interest not already represented by the SIGs to put forward their own ideas for streams. The conference aims to keep itself open to themes from a wide variety of research communities, some of which might never have had contact with the ISSS before.

Secondly, in this meeting, we have several plenary speakers who have been nominated to give presentations as thought leaders by stream organizers who have brought in circa 15 papers. The Action Research, Roundtable, SABI, and System Engineering streams all have plenaries associated with them in this way.

Finally, there are many more workshops this year, which will hopefully be 'boundary spanning'. In each of these, a single theory or practice, developed in a given research community, will be presented. Participants from diverse research communities will work in small groups to look at the potential for using the idea within their own domains.

This conference represents a tremendously exciting learning opportunity, and we warmly welcome your participation here in Washington, whether you are a long-standing member of the ISSS or had never heard of us before!

So again, welcome to the 58th Meeting of the ISSS, and I hope you have a rich and fruitful learning experience.

Gerald Midgley
Centre for Systems Studies
University of Hull, UK
July 2014

Conference Program and Schedule
ISSS 2014

Sunday: July 27, 2014 – Pre-Conference Workshops

REGISTRATION DESK OPEN 08:00 – 18:00 (Lobby, Marvin Centre, 800 21st St. NW, Washington, DC)

09:00 – 17:00 Pre-conference Workshops		
1.	**Workshop – Systems Science and Beyond – Introduction to Systems and Schemas Theory** **Kent Palmer, Debora Hammond and Allenna Leonard** *Workshop will break for lunch and people are welcome to join at any time.*	
2.	**Workshop** **2195** - System Basics: Exploring the Relationship between Traditional Chinese Systemic Theory and Practice, and the Modern Systemic Theory and Practice, for a Comparative Learning across the Boundaries *Wong, Thomas Sui Leung; Huang, E C Yan* *Workshop will break for lunch and people are welcome to join at any time.*	
10:00 – 12:30		
1.	**Workshop** **2366 -** Principles for Living Systems Science of Groups and Societies - *Simms, James Robert*	
14:00 – 17:00		
1.	**Workshop** **2234** Exploring Living Systems Awareness through Movement – *Widhalm, Barbara*	

18:00 – 20:00 Reception
Evening Reception in Columbian Square, Marvin Center, 800 21st St. NW, Washington, DC.

Monday: July 28, 2014

REGISTRATION DESK OPEN 08:00 – 13:00 (Funger Hall, Lobby)

07:45 to 08:45 ISSS Roundtable Discussion (Funger Hall Room 320), Sue Gabriele, Brian Hilton, Shankar Sankaran, and others

09:00 Plenary Session (Funger Hall, Room 103)	
09:00	**Welcome to GWU: Professor Stuart Umpleby**
09:15	**Professor Gerald Midgley - University of Hull, Hull, UK** Title: Learning across Boundaries: Exploring the Variety of Systemic Theory and Practice
10:00	**Dr Derek Cabrera - Cabrera Research Lab, USA** In Search of Universality in Systems Thinking
10:45 – 11:15 Tea/Coffee (Funger Hall Lobby)	
11:15	**Prof. Jan-Hendrik Hofmeyr - University of Stellenbosch, South Africa** Systems Biology and Robert Rosen
12:00	**Dr Louis Klein – SEgroup, Germany** Systemic Consulting: A Learning History
12:20	**Announcement on ISSS Strategy, Bylaws and Social Media Workshop** Pamela Buckle and Billy Dawson
12:30 Lunch (Marvin Center,Columbian Square Restaurant)	

13:30 Parallel Sessions - Monday July 28, 2014				
Funger Hall Room 207	**Funger Hall Room 220**	**Funger Hall Room 221**	**Funger Hall Room 222**	**Funger Hall Room 223**
Organisational Transformation and Social Change **Chair: Tamar Zohar Harel** **2241** Using Organizational Design to Speed Human Evolution *Nuessle, Frank* **2266** Leverage Points in Systemic Change, an Empirical Evaluation of Meadows Taxonomy *Vodonick, E John* **2266** **2266** Whatever Happened to Systems Thinking? *Sommer, Micheal*	**Workshop** **Chair: Sue Gabriele** **2193** Adapting Co-operated RoundTables to Accelerate Learning and Connection in your Workplaces *Gabriele, Susan Farr*	**Designing Educational Systems** **Chair: Barbara Widhalm** **2175** Immersive and Interactive e-Learning in Universities *Avalos-Villarreal, Elvira* **2253** A Conceptual Model of Systems Thinking Leadership In Community Colleges *Powel Davis, Anne* **2261** Teaching Living Systems Awareness in Online and Hybrid Formats: Strategies and Lessons Learned across Disciplines *Widhalm, Barbara* **2317** Designing Learning Systems? Exploring Critical Systems Philosophy for the Design of Learning Activities for Student Success and Satisfaction *Shaw, Corrinne*	**Critical Systems Theory and Practice** **Chair: Todd Bowers** **2249** Developments in Critical Systems Theory: On Paradigms and Incommensurability *Bowers, Todd David* **2303** Knowing Differently in Systemic Intervention *Rajagopalan, Raghav* **2252** Plurality of Meanings in an Intervention: An "Intentionally Complex" Account *Velez-Castiblanco, Jorge Ivan* **2213** A Critical Systems Exploration of Ethics in the Context of Negotiations *Pinzon-Salcedo, Luis Arturo; Montoya-Villa, Maria Juliana*	**Health and Systems Thinking** **Chair: Thomas Wong** **2182** Testing a Law of Optimal Variety and Order for Development, through Action Research on Profound Mentally Retarded Adults *Paritsis. Nicholas K.; Gkandona, Georgia* Presenting by Skype **2270** The systemic crisis of climate change: clinical and political implications *Kearney, Philip* **DISCUSSION** **60 minutes**
15:30 Tea/Coffee (Funger Hall Second Floor Lobby) – Poster Viewing in Funger Hall Second Floor Lobby				

16:00 Parallel Sessions - Monday July 28, 2014					
Funger Hall Room 207	**Funger Hall Room 220**	**Funger Hall Room 221**	**Funger Hall Room 222**	**Funger Hall Room 223**	**Duques Hall Room 251**
Systems Philosophy **Chair: David Rousseau** **2341** Philosophical Orientations: ISSS Founding Fathers/Mothers *Hammond, Debora* **2361** Boulding's Social Science Gravimeter: Can Hierarchical Systems Theory Contribute to its Development? *Wilby, Jennifer* **2359** GET, SSD, ESD: The Evolution of Evolutionary Systems Design *Laszlo, Alexander* **2246** Beyond Systems "Thinking" to a Science of Systems Processes Engineering: Similarities,	**Critical Systems Theory and Practice** **Chair: Todd Bowers** **2171** Feminist Systemic Intervention: Integrating Gender, Nature, and Inclusion for Social Change in Rural Development *Lewis, Ellen D.* **2272** Leadership Issues in Medium Scale Acephalous Groups *MacGill, Victor Ronald David* **2263** The Role of Systems Models in Supporting the Formation of Inter-disciplinary Research Teams *Gregory, Amanda; Atkins, Jon* **2372** Cloudy with a Chance of Roughness: An Inquiry into Fractal Roughness and Systems *Dawson, Billy*	**Designing Educational Systems** **Chair: Barbara Widhalm** **2332** An Evolutionary Framework for Global Sustainability Education: An Integral Posthuman Perspective *Joseph, Brett R.* **2183** Exploring the Variety of Systems Science in the Classroom *Badillo Piña, Isaías; Tejeida-Padilla, Ricardo; Morales-Matamoros, Oswaldo* **2316** Exploring Changes In Task Complexity Awareness when a Group of Stakeholders Worked on a Complex Issue of Concern	**Knowledge Systems Science** **Chair: Taketoshi Yoshida** **2151** Knowledge Sharing and Professional Online Communities Acceptance In Egypt: An Integrated Model *Montash, Mohammed; Dwivedi, Ashish; Vidgen, Richard* **2273** Cultivation of Perception and Creativity by Repeating Systems Approach *Yoshida, Taketoshi* **2378** Sustainable EU (China/US/UK) applying Stafford Beer's VSM to De-centralize "The System" (Part 2 of "A System that Works") *Li, Jon*	**Complexity Science** **Chair: Dennis Finlayson** **2280** GS2:The Universe and all its Parts are 10di Superorganisms *Sancho, Luis* **2142** Toward the Structuring of Meanings of the Mexican Day of the Death Ritual, under a Complex Systems Approach *Canales, Berna Leticia V; Badillo Piña, Isaías; Morales-Matamoros, O.; Tejeida-Padilla, R.; Peón-Escalante, I.* **2362** The General Theory of Metadynamics Systemicity: Part 6: Neighbourhood and the 4D Neighbouring of Natural Things *Blanc, Jean-Jacques* **2322** A Machian Perspective on the Systems Approach *Reschke, Carl Henning*	**Cybernetics** **Chair: Allenna Leonard** **2328** Exploring Organizational Proprioperceptio *Leonard, Allenna* **2365** A (Design-Cybernetic) Critique of Formal Education *Herr, Christiane Margerita; Fischer, Thomas* **2238** Technology as an Observing System: A 2nd Order Cybernetics Approach *Demetis, Dionysios S*

Differences & Effects on Research to Applications *Troncale, Len*		*Andersson, Pia* **2329** Interdisciplinarity Model for Management Education Design by Soft System Methodology *Cezarino, Luciana Oranges; Bartocci Liboni, Lara; Ferreira Caldana, Adriana*			**Viable System Model** **2172** A Systemic GRC Maturity Model *Pernet, Emir Hernando; Cano, Jeimy Jose*

Dinner available at nearby local restaurants

19:30 Evening	
19:00 – 21:00	**Funger 221** **Workshop** **2377 Jon Li:** Yes We CAN Govern California, Jerry Brown! (Edmund G. Brown, Jr.'s final five year plan?)

Tuesday: July 29, 2014

REGISTRATION DESK OPEN 08:00 – 13:00 (Funger Hall, Lobby)
07:45 to 08:45 ISSS Roundtable Discussion (Funger Hall Room 320), Sue Gabriele, Brian Hilton, Shankar Sankaran, and others

09:00 Plenary Session (Funger Hall, Room 103)	
09:00	**Prof. George Richardson - University at Albany, State University of New York** Models that Matter: System Dynamics Applications with Impact
09:45	**Gary Smith** Understanding Disease with Systems Thinking
10:45 – 11:15 Tea/Coffee (Funger Hall Lobby)	
11:00	**Dr James Thomas - UNC School of Public Health** Systems Applications in Global Health
12:10	**Sue Gabriele – GEMS Learning** The ISSS RoundTable: Its Underpinnings and Evolution
12:30 Lunch (Marvin Center,Columbian Square Restaurant)	

13:30 Parallel Sessions - Tuesday July 29, 2014					
Funger Hall Room 207	**Funger Hall Room 220**	**Funger Hall Room 221**	**Funger Hall Room 222**	**Funger Hall Room 223**	**Duques Hall Room 251**
Systems Engineering **Chair: Janet Singer** **2148** General Systems Theory through Linguistic Modelling *Korn, Janos* **2158** Hybrid Methodology for the Diagnosis of a Tumor Prosthesis Knee *Huerta, Aideé; Hernández, Luis M; Domínguez,V M.* **2161** Systemic Parameter Estimation for the Diagnosis and Treatment of Developmental Dysplasia of the Hip in Children *Araujo, Benjamín; Hernández Simón, Luis Manuel; Domininguez Hernández, Victor Manuel* **2286** Synthesizing Traditional Chinese Medicine and Engineering through System Engineering *Wong, Thomas; Huang, E C Yan*	**Critical Systems Theory and Practice** **Chair: Todd Bowers** **2166** Using Boundary Games for Analysing Actor's Interactions *Rivas, Luz Maria* **2321** The Boundary Triage: A Systemic Leadership Tool *MacNamara, Delia P.* **2203** Employing Boundary Critique to Enhance Judgments of Quality in Evaluation *Gates, Emily* **2186** A Critically Reflexive Approach for the Study of Innovative Processes and Activities Shaping Strategic Decisions: Conducting Systemic Intervention Based on the Boundary Critique Theory *Alharbi, Yousef Obaid*	**Workshop** **Chair: Tony Hodgson** **2210** The IFF World Game: Resilience in a Complex System *Hodgson, Anthony Malcolm*	**Workshop** **Chair: Jonathan Morrell** **2233** Combining "Traditional" Knowledge with Complex Adaptive System Understanding of How the World Works *Morell, Jonathan A.*	**Evolutionary Development** **Chair: Alexander Laszlo** **2174** The Mind, Consciousness and the Self *Di Corpo, Ulisse; Vannini, Antonella* **2264** Civilization Level Index (CLI): A Systemic Instrument for Measuring the Level of Development, or How Human are we actually becoming *Hu, Jason Jixuan* **2307** Systems Thinking for Strengthening National Competitiveness in South Korea *Shim, Yeon-soo(Youn-soo)* **2289** Towards the Composition of the Community System in the Political Practice of Tourism in the State of Hidalgo, Mexico *Briones-Juarez, Abraham; Cruz-Coria, Erika; Tejeida-Padilla, Ricardo*	**SABI: Dialogue in Systems Applications in Business and Industry** **Chair: Louis Klein** **2179** Security from a Systems Thinking Perspective: Applying Soft Systems Methodology to the Analysis of an Information Security Incident *AlSabbagh, Bilal; Kowalski, Stewart* **2298** Systems Management and Information Metrics based on Time Distortion and Profit *von Schéele, Fabian E. G.; Haftor, Darek M.* **2371** Fast and Functional Feed-back Loops for Small Business *Talley, Graham; Jahromi, Ashkahn* **2373** Chinese Business Systems: A Historical Systemic Approach *Hilton, Brian J.*
15:30 Tea/Coffee (Funger Hall Second Floor Lobby) – Poster Viewing in Funger Hall Second Floor Lobby					

16:00 Parallel Sessions – Tuesday July 29, 2014					
Funger Hall Room 207	**Funger Hall Room 220**	**Funger Hall Room 221**	**Funger Hall Room 222**	**Funger Hall Room 223**	**Duques Hall Room 251**
Systems Applications in Business and Industry: Systemic Project Management **Chair: Louis Klein** **2169** Project Management as Discovery *Chew, Eng; Agarwal, Renu; Sankaran, Shankar* **2223** Systemic Approach to Address the Cost Overrun and Delay in Complex Large-Scale Hydropower Projects: A Case Study of Neelam-Jehlum Hydropower Project in Pakistan *Choudhary, Muhammad Abbas; Umair, Muhammad* **2190** A Systems View of Community Engagement: Exploration for Simple Rules of Interaction to Explain Community Resistance in Landfill Siting Situations *Cook, Phil*	**Workshop** **Chairs: Anne Stephens and Ellen Lewis** Boundary Critique, Marginalization and Inclusion *Stephens, Anne; Lewis, Ellen D.*	**Organisational Transformation and Social Change** **Chair: Tamar Zohar Harel** **2327** Systemic Innovation: Theoretical Considerations *Lindhult, Erik; Midgley, Gerald* **2277** A Complementarist Approach to Lean Systems Management *Calvo-Amodio, Javier; Flumerfelt, Shannon; Hoyle, Christopher* **2293** Adaptive Leadership and Social Movements, Applying the Complex Theory of Leadership *Gamero Henríquez, Claudio Marcelo; Almonacid Acevedo, Ricardo* **2248** Technology Management through Space Agencies *León Vega, Cirilo Gabino; Vázquez, Oscar Dolores; Iturri Hinojosa, Luis Alejandro*	**Research into a GST** **Chair: David Rousseau** **2242** Toward a System Type Structure *Marzolf, Tom* **2279** General System Theory: Towards the Unification of Science *Pretel Wilson, Manuel* **2325** The SM Systems Paradigm: A Paradigm, Pattern, Reference Model, Meta-model, and Holon for "Unifying" the Systems Disciplines, Creating a General Systems Theory, and Systems Praxis *Hettinger, Matthew K* **2299** Consilience Leadership in the Edge of Chaos *Lin, Kingkong*	**Service Systems Science** **Chair: Jim Kijima** **2302** Towards a Service Ecology Approach to Improve Social Service Uptake and Outcomes for 'Hard To Reach' Populations *Foote, Jeff* **2368** Multi-level Adaptive Cycles Model for Service Innovation Ecosystem *Kijima, Kyoichi Jim* **Agent Based Social Systems** **2173** Reflexivity In Agent-Based Computational Models *Garcia-Diaz, Cesar; Olaya, Camilo*	**Workshop** **Chair: Bob Williams** **2229** Using Systems Concepts In Evaluation Design *Williams, Bob*
Dinner available at nearby local restaurants					
19:30 Evening					
18:30 – 19:30	**Council Meeting -- Funger 221 – All Board, Trustees and SIG and National Chapter Chairs**				

Wednesday July 30, 2014

REGISTRATION DESK OPEN 08:00 – 13:00 (Funger Hall, Lobby)
07:45 to 08:45 ISSS Roundtable Discussion (Funger Hall Room 320), Sue Gabriele, Brian Hilton, Shankar Sankaran, and others

09:00 Plenary Session (Funger Hall, Room 103)	
09:00	**Janet Singer - Systems Praxis** Rethinking Systems Engineering Skills: managing boundaries, borders, and framings **Gene Bellinger – Systems Thinking World Virtual Presentation** Title: Systems Thinking World - Passionate Relentless Unfolding
10:30 – 11:00 Tea/Coffee (Funger Hall Lobby)	
11:00	**Dr Anne Stephens - James Cook University, Cairns, Australia** After the Theorising: Improving the Impact of our Work
11:45	**Prof. Shankar Sankaran - University of Technology, Sydney, Australia, facilitated by Louis Klein with Mary Edson, Pam Buckle, Debora Hammond, John Kineman, Gary Metcalf, and Will Varey (remote)** Panel on Systems Research
12:30 Lunch (Marvin Center,Columbian Square Restaurant)	

13:30 Parallel Sessions - Wednesday July 30, 2014			
Funger Hall Room 220	**Funger Hall Room 221**	**Funger Hall Room 222**	**Funger Hall Room 223**
Relational Science **Chair: John Kineman** **2176** Presenting Skype Syntropy and Sustainability *Di Corpo, Ulisse* **2348** A Relational Framework for Sustainability Science *Kineman, John* **2349** Roots of Sustainability in Ancient India *Kineman, John; Anand, Deepak*	**Information Systems Design and Information Technology** **Chair: Kevin Doyle** **2149** Adverse Selection Behavior and Counteracting Mechanisms in E-Commerce Market: Case Study from Taobao.com (China) *Pan, Yong* **2152** A Systems Approach to Business Process Evolution *Doyle, Kevin G* **2227** An Approach for Software Architecture by Understanding Value Requirements, developing Value Proposition, and Subsequently Realizing Value *Kumar, Anand; Lokku, Doji Samson; Zope, Nikhil Ravindranath* **2271** Study on IT Service Management at a Polytechnic College *Wada, Hatsue; Yoshida, Taketoshi*	**Workshop on ISSS Strategy** **Chairs: Pam Buckle and Billy Dawson** **Ellen Lewis** **Delia McNamara** **Simon Kalechstein**	**Workshop Part 1:** **Chair: David Ing** **2254** Incubating Service Systems Thinking: New Frames for Collaborating on a Pattern Languages for Service Systems *Ing, David*
15:30 Tea/Coffee (Funger Hall Second Floor Lobby) – Poster Viewing in Funger Hall Second Floor Lobby			

16:00 Parallel Sessions – Wednesday July 30, 2014				
Funger Hall Room 207	**Funger Hall Room 220**	**Funger Hall Room 221**	**Funger Hall Room 222**	**Funger Hall Room 223**
Living Systems Analysis **Chair: Jim Simms** **2367** Science of Society Evolution *Simms, James Robert* **Workshop** **90 mins** **2366** Principles for Living Systems Science of Groups and Societies *Simms, James Robert*	**System Dynamics** **Chair: Leopoldo Sanchez-Cantu** **2156** Dynamic Analysis of Supply and Demand for Elementary School English Teachers in Taiwan *Peng, Hui-Ling; Chen, Jian-Hung; Hsiao, Chih-Tung; Shen, Chao-Ying* **Systems Modeling and Simulation** **2146** Towards a Complex Systems Approach in Characterizing Volatility during Financial Markets Crisis *Sanchez-Cantu, Leopoldo* **2268** Understanding Food Security Narratives using Grounded Theory and Systems Thinking *Rimal, Naresh*	**Joint Session of the Systems Pathology and Systems Engineering SIGs** **Chair: Len Troncale** **2204** Assessment of a Socio-Technical System using Systems Process Theory and Systems Pathology *Gilbert, Dawn; Troncale, Len* **2243** SPT-Based Systems Pathology: Test of Concept using Healthy-Pattern Compared to Dysfunction Patterns in Real Systems *Hybertson, Duane; Troncale, Len* **2245** Seven Alternative Models or Tools for using or Applying Systems Processes Theory (SPT) *Troncale, Len*	**Workshop on ISSS Strategy** **Chairs: Pam Buckle and Billy Dawson** **Ellen Lewis** **Delia McNamara** **Simon Kalechstein**	**Workshop Part 2:** **Chair: David Ing** **2254** Incubating Service Systems Thinking: New Frames for Collaborating on a Pattern Languages for Service Systems *Ing, David*

Dinner available at nearby local restaurants	
19:00 Evening	
19:30 – 21:00 **Funger Hall 221**	**Syria and Ukraine and other current conflict situations, do we as system people have anything to contribute?** Dennis Finlayson

Thursday: July 31, 2014

REGISTRATION DESK OPEN 08:00 – 13:00 (Funger Hall, Lobby)
07:45 to 08:45 ISSS Roundtable Discussion (Funger Hall Room 320), Sue Gabriele, Brian Hilton, Shankar Sankaran, and others

09:00 Plenary Session (Funger Hall, Room 103)	
09:00	Introduction to the Day
09:15	**Professor Peter Stratton** The 50-year Evolution of Systemic Practice in Family Therapy
10:00	**Professor Ray Ison, Gerald Midgley** Cybernetics Panel
10:45 – 11:15 Tea/Coffee (Funger Hall Lobby)	
11:15	**Professor Peter Caws and Dr David Rousseau - Von Bertalanffy Lecture** General Systems Theory - Past, Present and Potential
12:30 Lunch (Marvin Center, Columbian Square Restaurant)	

13:30 Parallel Sessions – Thursday July 31, 2014					
Funger Hall Room 207	**Funger Hall Room 220**	**Funger Hall Room 221**	**Funger Hall Room 222**	**Funger Hall Room 223**	**Duques Hall Room 251**
Action Research **Chair Shankar Sankaran** **2189** Using Reflection and Storytelling to Inform Evidence-Based Decisions *Algeo, Chivonne Therese* **2170** Using Action Research to implement an Oral Discourse Approach for Teaching English Composition Writing *Wong, Christina Hsui Peng* **2184** An Action Research Study on using Elegant Tasks for Primary One Pupils to Learn Art *Poh-Lim, Fiona* **2375** Time and Dynamic Boundaries: The Impact of Action Based Learning *Nouaala, Susu*	**Systems Engineering** **Chair: Janet Singer** **2215** Reducing Acquisition Cost by Minimizing the Requirements Solution Space *Logan, Bradford A.* **2178** Scientific Research for The Mexican Satellite System *León Vega, Cirilo Gabino* **2154** Systemic Design of a Sliding Mode Based Model for Analyzing the Performance of an Acoustic Sensor *Patino-Ortiz, Miguel* **2155** Analysis of Hurst Exponent and the Fractal Dimension of Seismic Activity occurred in the Cocos Plate, Mexico *Patino-Ortiz, Julian*	**Workshop** **Chairs: Ron Cottam, Willy Ranson and Roger Vounckx** **2194** System Duality and the Included Middle *Cottam, Ron; Ranson, Willy; Vounckx, Roger*	**Workshop** **Chairs: Eve Pinsker and Michael Lieber** **2236** Activities Analysis: An Ethnographic Methodology for a Systems Approach to Program Implementation and Evaluation *Pinsker, Eve C; Lieber, Michael D*	**Systemic Design** **Chair: Peter Jones** **2346** Design Research Methods for Systemic Design: Perspectives from Design Education and Practice *Jones, Peter* **2228** Systems and Design: Mutually Influencing Disciplines and Practices? *Ison, Ray* **2209** Bringing Foresight into Systems Thinking: A Three Horizon Approach *Hodgson, Anthony Malcolm*	**Systems Philosophy** **Chair: David Rousseau** **2355** A Scientific Revolution in the Philosophy of Science *Umpleby, Stuart A.* **2217** Systems Philosophy: Understanding Ethics, Defending Relativism, and Recognizing Progress *Artigiani, Robert* **2284** Systemic Design for Applying Deleuzian Concept of "˜Pragmatics' to Education and Community Practices *Yu, Jae; Hong, Hyo Chang* **2379** Beyond Systems Philosophy Further Conceptual Trends in the History of Systems Philosophy From Systems Philosophy to a Philosophy of Schemas *Palmer, Kent D.*

15:30 Tea/Coffee (Funger Hall Second Floor Lobby) – Poster Viewing in Funger Hall Second Floor Lobby

16:00 Parallel Sessions – Thursday July 31, 2014					
Funger Hall Room 207	**Funger Hall Room 220**	**Funger Hall Room 221**	**Funger Hall Room 222**	**Funger Hall Room 223**	**Duques Hall Room 251**
Action Research **Chair: Shankar Sankaran** **2187** A Scaffolding Strategy for Helping Lower Secondary Science Students Construct Scientific Explanations for Experimental Based Questions in Science *Goh, Deborah; Shireen, Zulaiha* **2257** A Qualitative Transdisciplinary Participatory Action-Research Approach: Toward the Systemic Transformation of the Educational Process *Peón-Escalante, Ignacio* **2159** Enhancing Lean Interventions through the Use of Systems Thinking in the Food Production Industry: A Case in the Niger Delta Region, in Nigeria *Ufua, Daniel Ebakoleaneh*	**Critical Systems Theory and Practice** **Chair: Todd Bowers** **2274** A Critical Systems Perspective on Research Methodology for Research in E-Learning in Information Systems Classes *Goede, Roelien* **2294** Part 1: Three Distinct US State-Level Population Demographics Shown through a Political Lens. How can this be in a Two-Party System? And, Democratic Principles Apply to all, Right? *Tarling, John; Tickler, S.* **2295** Part 2: The Four Pillars of Democracy (freedom, equity, representation and justice) have Eroded. Who stole the dream? Was it an illusion or a simple case of bait and switch? *Tarling, John; Tickler, S.*	**Workshop** **Chai: John Kineman** **2235** Relational Theory Workshop *Kineman, John*	**Systems and Mental Health** **Chair: Tamar Zohar Harel** **2276** Measuring Quality in Family Systems: The SCORE Index of Family Functioning and Change *Stratton, Peter* **2345** A Systemic Approach to Language and Symbolic Representation *Valle Canales, Berna Leticia* **2300** Understanding Systems Thinking: Moving From Categories to Competencies *Buckle Henning, Pamela* **2357** Learning Across Boundaries: Exploring the Value of Systemic Theoretical Integration Model and Implementation Program on Kindergarten	**Hierarchy Theory** **Chair: Billy Dawson** **2163** System Duality: Birational Hierarchy *Cottam, Ron; Ranson, Willy; Vounckx, Roger* **2220** Advancing the Social Science Paradigm Shift: Boulding's Typology, TPO Theory and the Triple Action RoundTable *Gabriele, Sue* **2265** Adaptive Capacity in Project Teams *Edson, Mary C; Metcalf, Gary S.* **2344** A New Systems View of Ecosystems (with an Emphasis on Soils) *Lin, Henry*	**Science and Spirituality** **Chair: Fabiano Crespo** **2340** Science and Spirituality *Crespo, Fabiana* Intro: *Fabiana Crespo* 1- Viviana **Koldorff** "Cellurar Memory" 2- Ernesto **Van Peborgh** "IT" 3- Christian **Plebst** "Values" 4- Peter **Straubinger** "Vivir de la luz" 5- Ervin **Laszlo** "Akasha" 6- Fabiana **Crespo** "Pure Love" 7- Masaru **Emoto** "Water Peace Project" Conclusions: *Fabiana Crespo* *There will be a combination of speakers in person and by video presentations.*

2364 Women in Rural America: Uncovering Their Voices to Identify and Understand The Critical Elements of Well-Being *Burleson, Deeana L.*	**Skype presentation** **2230** Systemic Approach for Change Agent: A Negotiated Evaluation Framework for Social Development In China *Leung, Charles Tong-lit*		Practices and Healthy Development Among Kindergartners *Zohar Harel, Tamar*		
19:00 – 22:00	**Gather 7:00 p.m. for Dinner 7:30 p.m. until 10 pm.** **Conference Dinner in Columbian Square, Marvin Center**				

Friday: August 1, 2014

REGISTRATION DESK OPEN 08:00 – 13:00 (Funger Hall, Lobby)
07:45 to 08:45 ISSS Roundtable Discussion (Funger Hall Room 320), Sue Gabriele, Brian Hilton, Shankar Sankaran, and others

09:00 Plenary Session (Funger Hall, Room 103)	
09:00	**Dr Gerald Midgley – Closing Remarks**
09:15	**Dr Yiannis Laouris - Future Worlds Centre, Cyprus** Title: Acting Beyond Borders: Made Possible through Systems Science Applications
09:45	**Prof. Ray Ison - Open University, UK and Monash University, Australia** Governing the Anthropocene: The greatest challenge for systems thinking in practice?
10:15 – 10:30 Tea/Coffee (Funger Hall Lobby)	
10:30	**Student presentations, Vickers, Mead and Rapoport Awards**
12:00	**AGM ISSS Membership Meeting**
12:30 Lunch (Marvin Center, Columbian Square Restaurant)	

12:30 Close of Conference

Plenary Speakers

PROFESSOR GERALD MIDGLEY – PRESIDENT ISSS 2013/14

Gerald Midgley is Professor of Systems Thinking at the University of Hull, UK. He also holds Adjunct Professorships at the University of Queensland, Australia; the University of Canterbury, New Zealand; Mälardalen University, Sweden; and Victoria University of Wellington, New Zealand. From 2003-2010, he was a Senior Science Leader in the Social Systems Group at the Institute of Environmental Science and Research (New Zealand). He has had over 300 papers on systems thinking and stakeholder engagement published in international journals, edited books and practitioner magazines, and has been involved in a wide variety of public sector, community development, technology foresight and resource management research projects. He is the 2013/14 President of the International Society for the Systems Sciences, and has written or edited 11 books including, *Systemic Intervention: Philosophy, Methodology, and Practice* (Kluwer, 2000); *Operational Research and Environmental Management: A New Agenda* (Operational Research Society, 2001); *Systems Thinking, Volumes I-IV* (Sage, 2003); *Community Operational Research: OR and Systems Thinking for Community Development* (Kluwer, 2004); and *Forensic DNA Evidence on Trial: Science and Uncertainty in the Courtroom* (Emergent, 2011).

DR DEREK CABRERA

Dr. Derek Cabrera holds a PhD from Cornell University, is author of seven books and an internationally recognized expert in metacognition and systems thinking. He designed and taught the course on systems thinking as a member of faculty at Cornell University and was a research fellow at the Santa Fe Institute for the Study of Complex Systems. He was a National Science Foundation IGERT Fellow in Nonlinear Systems and a National Science Foundation post doctoral fellow in STEM Systems Evaluation. His theoretical models of systems thinking have made impact worldwide. He is a US patent holder and inventor of the DSRP diagramming method, the VMCL model of organizational design, ThinkBlocks, and MetaMap software, a suite of systems thinking tools used in K-12, higher education, NGOs, government agencies, corporations, and business schools around the world. Currently he is research scientist at Cabrera Research Lab. He lives in Ithaca, New York.

PROFESSOR JAN-HENDRIK HOFMEYR

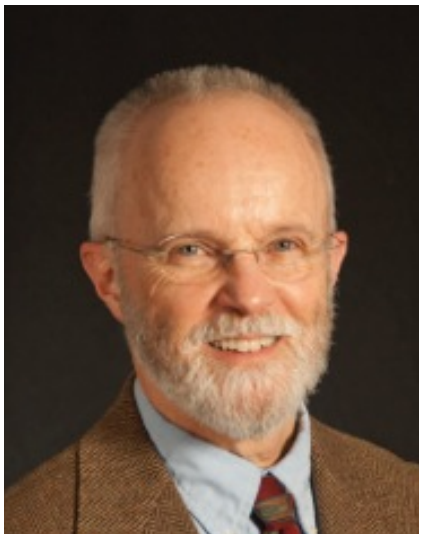
Jan-Hendrik (Jannie) Hofmeyr: Distinguished Professor of Biocomplexity and Biochemistry, Director of the Centre for Studies in Complexity at the University of Stellenbosch, and, since 1975, member of the Biochemistry Department. His research of the past 30 years has been in the field of computational systems biology where his main focus has been the understanding of regulatory design of metabolism. A recent interest is to seek a way of expressing formally the functional organisation of the cell in terms of a theory of molecular fabrication. He is also part of a research collaboration that is creating Code Biology, a new field that studies life through the lens of organic codes. He is a Fellow, and currently General Secretary, of the Royal Society of South Africa and also a member of the Academy of Science of South Africa. He is a founder member and Vice President of the International Society for Code Biology and a member of the Governing Body of the International Society for Biosemiotic Studies. He received the University of Stellenbosch Vice-Chancellors award for outstanding research in 1999. He was awarded the prestigious Harry Oppenheimer Fellowship Award for 2002, the Beckman Gold Medal of the South African Biochemical Society in 2003, and in 2009 the *Havenga Prize for Biological Sciences from the South African Academy for Science and Art.*

DR LOUIS KLEIN

Dr. Louis Klein is a leading expert in the field of systemic change management and complex project management on a global, cross-cultural stage. He is the founder of Systemic Excellence group and since 2001 Consortial Partner & President. Dr. Klein studied management sciences, cybernetics, sociology, anthropology, psychology, philosophy, politics and economics at universities in Germany and the UK. Dr. Klein holds a PhD in systems theory-based sociology. He is chairman of the Focus Group on Social and Cultural Complexity with the International Center for Complex Project Management (ICCPM). He was Vice President of the International Society for the Systems Sciences (ISSS) and is currently director at the World Organisation of Systems and Cybernetics (WOSC). He is member of the German Society for Political Consultants (degepol). He served as Head of Project Studies at Humbold-Viadrina School of Governance, and faculty of the Berlin School of Creative Leadership. In 2010 Dr. Klein was awarded the Inaugural Research Prize of the International Center for Complex Project Management for his works on social complexity in project management. Louis Klein is a long distance runner and mountaineer, a wine lover and wannabe accordionist. He is father of two children and lives in Berlin-Mitte.

TUESDAY

PROFESSOR GEORGE RICHARDSON



George P. Richardson is Professor Emeritus of Public Administration, Public Policy, and Informatics at the University at Albany. He is the author of more than fifty articles on theory and applications of system dynamics modeling, and three books: Introduction to System Dynamics Modeling with DYNAMO (1981) and Feedback Thought in Social Science and Systems Theory (1991, 1999), both of which were honored with the System Dynamics Society's Jay W. Forrester Award, and the edited two-volume collection Modeling for Management: Simulation in Support of Systems Thinking (1996). In 1985, he founded the System Dynamics Review and later served for seven years as its Executive Editor. Professor Richardson has been honored with awards from the University at Albany and the State University of New York for Excellence in Teaching (2003) and Excellence in Academic Service (2010). In 2011, the System Dynamics Society recognized him with its award for Outstanding Service for his contributions to the Society and the field. In 2013 he was honored with the Rockefeller College Distinguished Service Award.

GARY SMITH

Gary was born in Coventry in the UK in 1964. He joined GEC Telecommunications at the age of 16 as a Junior Laboratory Assistant performing "goods inwards" inspections of raw materials and later electroplating process management. He gained several awards for process improvement, including the design and development of a software application suite for the laboratory. College education gained through day release. Graduated BSc Hons in Applied Chemistry and then joined GEC's graduate development program. During the merger of GEC and Plessey to form GPT, became the lead architect of the management system that governed the development of their System X digital switch product. From 1991 to 1998 was a member of INSSP (GPT's Intelligent Digital Switch) development team and established a solid foundation in understanding effective and efficient software and systems engineering practice. From 1999 to 2004 Gary was Project Manager and later Projects Director within GPTs (later Marconi) International Business, responsible for the delivery of national communications infrastructure solutions across Europe. In 2004, "just for fun", undertook the Open University course S807 Molecules in Medicine and as a direct result of the course published "Cancer, Inflammation and the

AT1 and AT2 receptors in the BMC Journal of Inflammation. This was featured in the UK national press, “Open University Student published new theory of inflammation”. Also in 2004 became responsible at Marconi for the corporate development of Project Management and in particular took a fresh look at the lifecycle management of products, contracts and business change. He is currently a senior systems engineer at Airbus Defense and Space and Lead Systems Engineer for their border security solution and systems of systems integration platform. He is also an INCOSE ESEP. Married with four children and four grandchildren. He uses his spare time to attend medical conferences and correspond with medical researchers promoting new ways of thinking to more effectively treat disease.

PROFESSOR JAMES THOMAS

Dr. James Thomas has over 30 years experience working in the field of public health. He earned a Bachelor of Science in Nutrition from the University of California, Davis, and then masters and doctoral degrees in epidemiology from UCLA. Over the course of his career, Dr. Thomas has been a policy advisor, nutritionist, program implementer, professor, researcher, technical advisor, manager, and founder of two nonprofit organizations. He has lived in the Democratic Republic of the Congo and Kenya, and has worked in many countries of Africa and Asia. As a professor of epidemiology at the University of North Carolina, his principal interests are in the social epidemiology of HIV/AIDS, and public health ethics and human rights. In addition to his many scholarly articles, he was an editor and author of a textbook on epidemiologic methods in the study of infectious diseases, and principal author of the American Public Health Association’s Code of Ethics. As Director of the USAID funded MEASURE Evaluation Project, Dr. Thomas is leading a global team that is advancing the capacity of countries and communities to monitor their epidemics and evaluate their programs to control them. Dr. Thomas brings to this effort a particular interest in complexity science and systems thinking. Two examples from his own work are organizational network analysis to improve coordination of disease control efforts, and the evaluation of structural interventions.

SUSAN FARR GABRIELE

Susan Farr Gabriele, PhD, taught for twenty years in Los Angeles schools, including assignments as mentor teacher and department chair. Later, studying systems methods for education under Bela H. Banathy, she earned a PhD in human science: social and institutional change by creating and researching the RoundTable. The Los Angeles RoundTable Development Team convenes monthly text-study RoundTables where all are welcome to attend (see ASTD-LA, South Bay Special Division). Gabriele’s 2014 book *New Hope for Schools: Findings of a Teacher Turned Detective* tells her journey from front-line practice to ivory tower theory and back to front-line practice again.

WEDNESDAY

JANET SINGER

Janet Willis Singer is a leader in joint efforts by the International Society for the Systems Sciences (ISSS) and the International Council on Systems Engineering (INCOSE) to 'co-mature' systems science and systems engineering as disciplines that share a common systems thinking and systems appreciation core. In recent years she has been focused on identifying and presenting core elements useful to both practicing and upcoming systems engineers in the INCOSE-IEEE Body of Knowledge and Curriculum to Advance Systems Engineering (BKCASE) project. She is a second-generation member of ISSS. Her father, Roger F. Willis, was a mathematician who headed the first systems research group at Stanford Research Institute. For the past three decades she has worked to build on her father's insights into the strengths and limitations of mathematical modeling of systems with ideas from the broad range of fields needed to address the foundational challenges of the General Systems project. As part of this, she has pursued a broad range of studies including graduate work in mathematics and engineering as well as social science, humanities, and law. She is the current ISSS liaison to INCOSE and a former ISSS Vice President for Research and Publications.

GENE BELLINGER

Gene Bellinger is a passionate Systems Thinker, co-author of Beyond Connecting the Dots: Modeling for Meaningful Results, creator and host of the Systems Thinking Certification Program, host of the Systems Thinking World discussion group on LinkedIn, developer of SystemsWiki and currently developing a number of Systemic Kumu Learning Environments. The links for these systems thinking environments are: * http://beyondconnectingthedots.com/

* http://www.systemswiki.org/index.php?title=Systems_Thinking_Certification_Program

* http://www.linkedin.com/groups/Systems-Thinking-World-2639211 & * https://www.youtube.com/watch?v=l8kTCU1kaPw

DR ANNE STEPHENS

Anne is a Post-Doctoral Senior Researcher with the Northern Futures Collaborative Research Network based at James Cook University's Cairns Institute. With a PhD in sociology (UQ, 2011), Anne's field of interest is community development using systems thinking methodologies. Anne leads applied research projects that span Indigenous preventative health, Northern Australian regional and community development, and Indigenous adult education and training. Anne has been with the Cairns Institute since 2011. Anne is currently a board member of FoodSwell Inc, a charity supporting food security for remote communities, and was a founding member and inaugural

chair of Food Connect Inc., based in Brisbane. Anne is also a registered Queensland Teacher, with 10 years of school-based teaching and research with Education Queensland between 2000 and 2010.

PROFESSOR SHANKAR SANKARAN

Professor Shankar Sankaran BSc MEng PhD specialises in project management, systems thinking and action research, He is a Professor of Organisational Project Management at the University of Technology Sydney. Shankar's own research covers project governance, leadership, evaluation of action research and megaprojects.

Shankar is the current Vice President of Publications and Research at ISSS and chair of the Action Research SIG. Shankar is a distinguished fellow of the Action Research Centre at the University of Cincinnati, and an associate of the Project Management Chair at UQAM = in Montreal, Canada.

Shankar has published papers in is systems thinking and action research on journals such as *Systems Research and Behavioral Sciences*, *Systemic Practice and Action Research* and *Action Research* and presented papers at ISSS Conferences since 2006. He was a member of the 'Systems Research' team that met at the IFSR conversations held at Linz in 2014. He is the founding editor of the open source journal *Organisational Project Management*.

THURSDAY

PROFESSOR PETER STRATTON

Peter Stratton is a Systemic Family Therapist and developmental psychologist with broad research interests and involvement in statutory processes that affect families. His research includes development of an outcome measure for families in therapy (the SCORE project); the effects of basing training on concepts of active learning and the dialogical construction of self; the relationships of humour and creativity during psychotherapy; attributional analyses of family causal beliefs and blaming; public attitudes to terrorism by combining attributional coding with metaphor analysis. He is a member of the CAMHS Outcomes and Evaluations and the CYP-IAPT Critical Friends groups; Editor of the journal*Human Systems*; Chair of European Family Therapy Association Research Committee and recently stood down as Academic and Research Development Officer for the Association for Family Therapy and Chair of the UKCP Research Faculty.

PROFESSOR PETER CAWS

Peter Caws earned his B.Sc. (hons.) in Physics at the University of London in 1952 and his Ph.D. in philosophy at Yale University in 1956. He is University Professor Emeritus of Philosophy at the George Washington University in Washington, DC, and remains on the Honors faculty there, in which he teaches one seminar each fall semester. Before his 30-odd years at George Washington he had taught physics at Wilmington College, North Carolina (now UNC-Wilmington) and natural science at Michigan State University, had served a stint as an executive at a large foundation (Carnegie Corporation of New York), and had held professorships of philosophy at the University of Kansas and the City University of New York (Hunter College and the CUNY Graduate Center). He is a Fellow of the AAAS and a former president of the SGSR, which has entitled him to a nominal place on the Board of Distinguished Advisors of its successor organization, ISSS. He has served on the (US) National Research Council and in various capacities on the Boards of the American Civil Liberties Union, the American Philosophical Association, and the International Federation of Philosophical Societies (FISP). His seven books and well over 200 other publications have dealt with the philosophy of science, ethics, continental philosophy (especially structuralism and the work of Jean-Paul Sartre), and political philosophy.

DR DAVID ROUSSEAU

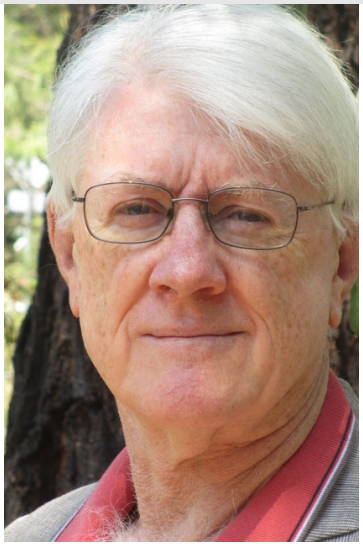
David Rousseau PhD BEng FRSA is the Director of the *Centre for Systems Philosophy* in Surrey, which promotes the use of Systems Philosophy as a methodology for addressing problems that require both scientific and philosophical analysis. In particular, he is interested in how we can use systems thinking to bring matters of ultimate concern into the domain of science. He is Editor-in-Chief of *Systema*, the journal of the *Bertalanffy Centre for the Study of Systems Science*. He chairs the Special Integration Group on *Systems Philosophy* in the *International Society for the Systems Sciences* and is Visiting Fellow at the *Centre for Systems Studies* and the *Centre for Spirituality Studies*, both at the University of Hull. He is an Honorary Research Fellow in the *Alister Hardy Religious Experience Research Centre* in the University of Wales, and an Executive Member and Company Secretary of the *British Association for the Study of Spirituality*. He is a Fellow of the *Royal Society for the encouragement of Arts, Manufactures and Commerce* (RSA). His academic background spans Engineering (with a specialisation in Systems Engineering), Philosophy (with a specialisation in Philosophy of Mind) and Religious Studies (with a specialisation in spiritual experiences). His career involved more than 20 years in senior management, programme management and systems engineering roles in the aerospace and semiconductor industries. Over that period he maintained a long-standing interest in the Big Questions, and the clues about them provided by exceptional human experiences, via trusteeships of various charitable research-oriented societies and trust funds. David's current interest is using Systems Philosophy to investigate the unity of knowledge, the modelling of Nature, and the ontological foundations of moral intuitions.

FRIDAY

DR YIANNIS LAOURIS

Laouris is a social and business entrepreneur, a neuroscientist, and a systems engineer with academic background in medicine and systems engineering. He chairs Future Worlds Center and is Rector of N.E.T.S., an innovative Graduate School, whose 20 PhD students collaborate to develop scientifically grounded methodologies and tools to "design" our future and to re-invent systems of governing. He is member of the European Commission's Think Tank that developed the Onlife Manifesto (https://ec.europa.eu/digital-agenda/en/onlife-original-outcome), promotes the application of mobile learning and broadband technologies to bridge ethnic-, digital-, economic-, educational- and inter-personal divides on our planet. He was member of the Cyprus Conflict Resolution Trainers Group that planned and carried out trainings in communications- and conflict resolution skills that eventually reached thousands from both the Greek and Turkish communities. Together with Aleco Christakis and Marios Michaelides, he applied the Structured Democratic Dialogue Process (SDDP) worldwide. His books MasksofDemons.com and Citizens Commandments.com are relevant. His contributions in systems science applications were recognized by the Hellenic Society for Systemic Studies with their 2008 Award. His group develops systems to enable scaling-up the SDD process to engage asynchronously thousands in meaningful dialogue, accelerating positive societal change.

PROFESSOR RAY ISON – PRESIDENT ISSS 2014/15



Is Professor, Systems for Sustainability at the Monash Sustainability Institute (MSI), and Professor of Systems, The Open University UK (OU). He is responsible at present within the CADWAGO project for a work package on systemic governance (http://www.cadwago.net/) and leads the Systemic Governance Research Program in MSI; at the OU is co-responsible for managing a post-graduate program in Systems Thinking in Practice (STiP). He is President Elect of the ISSS (International Society for the Systems Sciences). Ray headed the OU Systems Department (1995-8; 25 academic staff) then from 2000-04 successfully coordinated a major interdisciplinary 5th Framework program (30 researchers, 6 countries) researching social learning for sustainable river catchment management as well as running an EPSRC funded Systems Practice for Managing Complexity Network. His contributions to systemic governance research began with pioneering work on participatory natural resource management (1985). He is the (co) author or (co) editor of 5 books, 30 book chapters, 110 refereed papers, 60+ other publications, 5 journal special editions and has been an invited Keynote speaker at many international and national conferences. He has had a wide range of significant national and international appointments based on his academic standing.

Plenary Abstracts

MONDAY

LEARNING ACROSS THE BOUNDARIES OF SYSTEMS SCIENCE AND MANAGEMENT SYSTEMS: TOWARDS A TRANSFORMATION IN NEW ZEALAND WATER MANAGEMENT

Professor Gerald Midgley - University of Hull, Hull, UK

Centre for Systems Studies, Business School, University of Hull, UK
School of Innovation, Design and Engineering, Mälardalen University, Sweden
Victoria Business School, Victoria University of Wellington, New Zealand
School of Political and Social Sciences, University of Canterbury, New Zealand
School of Agriculture and Food Sciences, University of Queensland, Australia

If we want to address highly complex local and global challenges (e.g., climate change, financial crises, energy shortages, wars, wealth inequalities, etc.), where disciplinary boundaries obstruct understanding of the interconnections between economic, social and environmental issues, we can ill afford to replicate these disciplinary boundaries in our own research community. I argue that there has been a large elephant squatting in the room at ISSS conferences for as long as I can remember (my first ISSS conference being in 1989). This elephant is the division of the systems research community into two major 'interest groups' or paradigms that have been labelled at different times as Systems Science versus Systems Thinking; Systems Science versus Systems Design; Systems Science versus Management Systems; Systems Theory versus Systems Practice; Biophysical versus Social Systems; Hard versus Soft Systems; and (woefully, because this makes most of the world's systems research invisible) the US tradition versus the UK tradition. For the purposes of this paper, I will use the terms 'Systems Science' and 'Management Systems'. Sometimes the elephant in the room has been pointed at with anger, and a squabble has ensued. Other times people have decided to ignore the elephant and have adopted a 'live and let live' attitude, prioritising harmonious relationships in our research community over healing the division. I believe that we need to move with speed and committed intellectual engagement to learn across the boundaries of these traditions if we really want to realize the full benefits of the range of Systems Sciences and Management Systems practices available to us. Indeed, in the face of systemic local and global challenges like those mentioned earlier, this is an ethical priority! I argue that both the Systems Science and Management Systems traditions have strengths and weaknesses, and the best of both is needed if we are to address complex interrelationships between social and environmental issues. I advance this argument following, not only 30 years of engagement in debates in the systems community on the value of theoretical and methodological pluralism, but also practical experiences in over fifty systemic interventions relating to the work of governments, businesses, voluntary organizations, community groups, and many multi-agency networks striving to create systemic solutions to issues that are beyond the control of any one participating organization. In this presentation, I will give an example of a project in New Zealand where work from both the Systems Science and Management Systems traditions was pivotal in overcoming a major, decades-long conflict over water

management policy with significant economic and environmental consequences for the country. If either one of these traditions had been neglected, I am certain that the project would have failed. However, while we might celebrate this victory, there is no room for complacency. Learning across the boundaries of Systems Science and Management Systems requires us to appreciate unfamiliar ideas that may confront our comfortable assumptions about what kinds of science and practice we should engage with. So far, only a small number of us have taken up this challenge. For our learning to succeed, and for us to develop a body of systems theory and practice that can genuinely address systemic challenges, we need to boldly develop integrated visions of systems theory and practice. There may be many such visions, and their advocates may end up competing in robust debate, but in the process the elephant should be banished to irrelevancy.

IN SEARCH OF UNIVERSALITY IN SYSTEMS THINKING

Dr Derek Cabrera - Cabrera Research Lab, USA

Systems thinking attempts to align the real-world in which we exist (ontological "systems") with our human cognition (epistemological "thinking"). If our thinking was in alignment with the real-world (e.g., our mental models always worked) then there would be no call to action nor field of study called systems thinking. When our mental models (thinking) are out of alignment with the real-world our solutions to problems fall short, unintended consequences occur, critically important complexities are ignored, and problems persist. Therefore, the study of systems thinking is born of the realization that we need to think differently about real-world systems.

Our minds are not blank slates...they are stamped with an imprint of reality, homegrown in the context of features of thing-ness, grouping, interrelating and perspectival properties that are often hidden to our conscious mind. So, we don't see these features, or "patterns of thinking." But they are there, giving reality structure and information meaning. Systems Thinking is a framework based on four dynamical patterns of thought that humans use to understand the world around us:

- Make distinctions between ideas or things. How we draw or define the boundaries of these systems is an essential aspect of understanding them. Whenever we draw a boundary to define a system's identity, that same boundary defines what is not the system. Any boundary we make is a distinction between two fundamentally important elements: the identity of the system, and the other stuff that is not the system.
- Organize ideas into part-whole systems. Any collection of things (objects, organisms, ideas, processes, people, organizations, processes, etc) can be thought of as a system. It is important to understand that "any thing" can be thought of as a system--any object or idea. If we think of what it takes to make any system, we can reduce it to two simple elements: the relationship among parts and whole.
- Recognize relationships of action and reaction between and among ideas. We cannot understand much about any thing without understanding how it relates to other things. Fundamentally speaking, whether we seek to analyze a single relationship between two things or many relationships amongst many things, we must consider two underlying elements: action and reaction, or the co-relating effects of two or more things.
- Take many perspectives (point and view) on an idea to better understand it. When we draw the boundaries of a system, or distinguish one relationship from another, we are doing so from a particular perspective. Sometimes these perspectives are so basic and so unconscious we don't even see them, but they are always there.

Perspectives are made up of a point (the subjective viewer) and a view (what the subject is viewing). When we shift perspective, we change the distinctions, relationships, and systems that we see or do not see.

These four "patterns of thinking" are awareness of how we think and build knowledge. But, each pattern is a simple rule that relates with the others to create a dynamic set of complex interactions that make up our understanding of the universe. Thus, any lack of systems thinking is the result of socialization and training toward a mindset of oversimplified reductionism, hierarchic/categorical thinking, and linear causality. With a new understanding of both these patterns and the physicality of conceptual structures, Systems Thinking has been taught, learned, and used in the private sector, public education (PreK-12), and university programs up to the doctoral level. New grammar, tactile manipulatives, and visualization mapping techniques for systems thinking are transforming our ability to teach and understand systems thinking.

SYSTEMS BIOLOGY AND ROBERT ROSEN - FRAGILE, YET PERSISTENT: A SYSTEMS VIEW OF SELF-FABRICATION AS THE KEY TO LIFE

Jan-Hendrik S. Hofmeyr

Centre for Studies in Complexity and Dept. of Biochemistry, University of Stellenbosch, Stellenbosch 7602, South Africa

The question of what distinguishes living organisms from non-living objects, or, more poetically, what separates the quick from the dead, is a deep biological problem. In my view, which has been influenced by the work of Robert Rosen, Howard Pattee, John von Neumann, Humberto Maturana, Francisco Varela and Marcello Barbieri, the fundamental distinguishing feature of life is the ability of organisms to continuously make themselves: in order to persist despite the fragility of its components, the cell must be able to autonomously fabricate all of them. All higher-order properties of living organisms, such as maintenance, growth, reproduction, development and adaptation, ultimately depend on this underlying ability. In this talk I propose a new formal model of the self-fabricating cell that incorporates three features that are generally accepted as necessary for life: a functional organisation that ensures self-fabrication, a molecular form of self-representation that can be copied, and an organic coding system that decodes the self-representation into functional cell components. Cells use a single, conceptually straightforward chemical process—polymerisation—to create large, linear molecules that fold themselves into functional, three-dimensional structures that can self-assemble into higher-order structures. The question is whether the choice of sequence construction by concatenation has logical consequences for self-fabrication. To answer this, I have created a formal language based on a structural hierarchy of letters, words, sentences and paragraphs that are analogous to chemical elements, metabolites, macromolecules and macromolecular assemblies. With this linguistic model I can describe a formal system that has the ability to write its own production rules, making it, in Rosen's terms, closed to efficient causation and therefore self-fabricating. The internal logic of the model necessitates features that map onto phenomena such as protein folding and the unassisted self-assembly of macromolecular complexes, which I have argued are what makes life as we know it possible [1].

Hofmeyr, J.-H.S. (2007) The biochemical factory that autonomously fabricates itself: A systems-biological view of the living cell, in Systems Biology: Philosophical Foundations, (Boogerd, F.C., Bruggeman, F., Hofmeyr, J.-H.S. and Westerhoff, H.V., eds), pp. 217-242, Elsevier, Amsterdam.

SYSTEMIC CONSULTING: A LEARNING HISTORY
Dr Louis Klein – SEgroup, Germany

Systemic Consulting has little to do with applying superior systemic model. It is more a question of attitude it seems. However this is again only one part of the story. When the Systemic Excellence Group was founded on the 12th of September 2001 based on the claim “Another change is possible!”, it unknowingly embarked on an adventurous learning journey towards a deepened understanding of the practice of systemic consulting. Rigorous self-application, systematic reflection, and continuous action research forced the SEgroup to reconsider the initial assumptions and that applied systems theory is only a beginning and never an end. Only if the practice of systemic consulting is a systemic one it can be successful. Yet, what is a systemic practice, and how can you learn it? The learning journey of the SEgroup offers some surprising insights.

TUESDAY

MODELS THAT MATTER: SYSTEM DYNAMICS APPLICATIONS WITH IMPACT
Prof. George Richardson - University at Albany, State University of New York

An overview of several high profile system dynamics model-based applications, selected to show what such models look like, how they emerged (often in multidisciplinary interventions), and how they were used successfully to influence strategy, policy, and decision making. Examples include project management, commodity cycles, urban dynamics, and infectious disease policy.

UNDERSTANDING DISEASE WITH SYSTEMS THINKING
Gary Smith

We face an immediate crisis in our healthcare systems worldwide. Recently presented at the INCOSE symposium, Gary will explain why current approaches to understand and treat disease are failing and why systems thinking is necessary for the solution. His talk will deliver a means for everyone to understanding topics such as cancer, autoimmune disease, inflammation, cell behaviour, drug interaction and nutrition.

Angiotensin II is a hormone within the renin-angiotensin system. Its effects in controlling blood pressure and thirst are universally recognized and well established. In the early part of this millennium we were somewhat puzzled to find that this blood pressure hormone had unforeseen apparently unrelated inflammatory effects and that an imbalance of this system was being implicated as a key driver not only in cardiovascular disease but in many diseases. Systems’ thinking reveals a far more profound role for the renin-angiotensin system in injury sensing, repair and development and provides an explanation for why it is closely associated with the inception and progression of all chronic inflammatory diseases (includes cancers, neurodegenerative diseases, chronic infections and autoimmune conditions). At some point in the future, manipulation of the angiotensin system, when used in synergy with other agents, will undoubtedly be used to far more effectively treat disease. The speed at which this goal is achieved will depend on our ability to adapt our thinking.

SYSTEMS APPLICATIONS IN GLOBAL HEALTH
Dr James Thomas - UNC School of Public Health

THE ISSS ROUNDTABLE: ITS UNDERPINNINGS AND EVOLUTION
Sue Gabriele – GEMS Learning

The ISSS RoundTable, offered every morning during our annual conference, is an eye-opening practice in real time democracy. We spend 5 minutes on short readings and a topic which leaves 55 minutes for individual comments, time divided equally among all present (e.g. 25 people = about 2 minutes each). Our experience is: Just as we break the sound barrier when we travel faster than the speed of sound, we break the communication barrier when we hear 25 authentic viewpoints in 50 minutes. This short plenary describes the ISSS RoundTable's underpinnings and evolution.

Regarding the RoundTable's underpinnings, Boulding's typology illuminates agency for instruction and management theory. TPO theory clarifies that Things/Tasks (T) should be designed so that People (P) can access and achieve them (each at their own rates for their own purposes) for optimal Outcomes (O). Systems methods unify two conflicting camps-- top-down and bottom-up approaches --in management theory. Finally, systems methods and the RoundTable develop the two approaches to five methods/paradigms for agenda delivery and development in groups.

Regarding its evolution, 15 years of RoundTables and resulting insights suggest three necessary sufficient conditions for systemic renewal. In other words, an ideal user-implemented innovation is ICE: inclusive, continuing, and emancipatory. Furthermore, the RoundTable has been expanded to three robust prongs to accelerate individual and group evolution to the third power. They are bottom-up (RoundTable), top-down (TPO Thermostat Guide) and in-out-in (the Triple Bottom Line).

WEDNESDAY

RETHINKING SYSTEMS ENGINEERING SKILLS: MANAGING BOUNDARIES, BORDERS, AND FRAMINGS
Janet Singer - Systems Praxis

All fields of engineering clearly require *systematic* work. But the cutting edge of the systems engineering community has been calling for development of methods and modes of thinking that will support *systemic* engineering as well. There is no shortage of systems material to draw on: the challenges are 1) identifying and integrating a core of material that is directly useful for systems engineers, and 2) making this inherently complex material accessible while retaining its open, pluralistic, multi-paradigmatic character.

SYSTEMS THINKING WORLD - PASSIONATE RELENTLESS UNFOLDING
Gene Bellinger – Systems Thinking World Virtual Presentation

Systems Thinking World was established by and for those who believe a systemic perspective provides the best foundation for creating effective approaches for dealing with challenges and shaping a better tomorrow. Our purpose is to create content and foster interactions which further understanding of a systemic perspective and enables

thinking and acting systemically. The story behind the evolution of Systems Thinking World with thoughts as to where it might be headed.

AFTER THE THEORISING: IMPROVING THE IMPACT OF OUR WORK

Dr Anne Stephens - James Cook University, Cairns, Australia

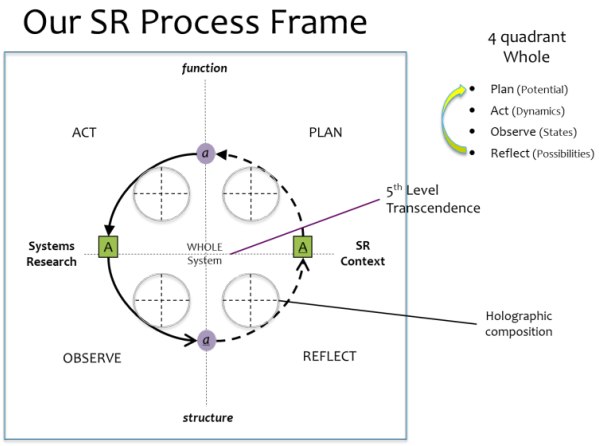
We researchers in systems science are at the forefront of understanding the enormity of the world's wicked problems bearing down upon us. Climate change, migration and population, disease, food security, species extinction, poverty and inequality – the problems are indeed vast at the global scale with manifestations apparent at our local scales. These are problems that affect us all. If the role of the researcher is to recognise and reveal matters of concern to be addressed by policy makers and politicians, then our task contains an ethical dimension to be mindful of the ways all beings on this earth are affected.

This presentation will review a set of principles for systems thinkers, to assist with the job of calling out the wilful denial, by those in power, of their own privilege. It starts by outing dualist relics of modernity to expose 'isms and undervalued inferior sides of dichotomies surreptitiously still at work. It concludes with a call to bring about social change where and when we can. In between, are several other principles that may improve our awareness and consideration of people and places on the edges of our practice. Inspired by feminist and critical systems thinking epistemologies, this presentation is not going to focus on gender politics, but rather, takes some of the learnings from decades of feminist theorising to see how we, as systems scientists, can benefit from their insights, and improve the outcomes and impact of our research.

ACTION RESEARCH PLENARY PANEL

Mary Edson, Louis Klein, Debora Hammond, Shankar Sankaran, Pamela Henning, John Kineman, Gary Metcalf and Will Varey (in spirit)

The Action Research Plenary to be held at ISSS 2014 in Washington DC will take the form of a panel discussion by the members of the IFSR 2014 'Systems Research' Team emulating a 'Reflective Action Research Process' to discuss the outcomes from the IFSR conversations on Systems Research. The panel session will begin with an introduction to the topic followed by a series of questions posed to the panel members by the facilitator, Dr Louis Klein, about which the members will reflect upon. The session will conclude with a summary of the process and expected outcomes for the future. The proposed agenda is:



Introduction – (the IFSR Conversation, our Systems Research focus, how we engaged in action research process through our week's discussions)

What are the key elements & criteria of good systems research?

How should high-caliber systems research be organized?

What should be the outputs of good systems research?

Impact and current practice?

Conclusion.

THURSDAY

THE 50-YEAR EVOLUTION OF SYSTEMIC PRACTICE IN FAMILY THERAPY
Professor Peter Stratton

Family therapy was launched from the early work of Gregory Bateson and others in the Hixon Symposia and then adopted a General System perspective. This paper charts some of the pathways taken by Systemic Family and Couples Therapy (SFCT) during the last 50 years, reviews current developments and invites consideration of developments in other areas of systemic theory and application that would benefit SFCT. In the process I will offer stages from my own erratic thread through these developments, through theories of contingency, causal attribution, schemas, and attachment to practice in reflexive learning and developing a self-report measure of family functioning. Early models of SFT included the strategic in which the therapist determines the systemic dysfunction and creates conditions that prevent the family from continuing with it, and the more collaborative structural with its focus on communicational and other boundaries, and triangulations. Major advances in the 1980s include 'Milan systemic', Murray Bowen's Systemic Family Therapy and Maturana's structurally determined systems. In Europe at least the field became resistant to explanations involving causality and there was a move to regarding the family as the only expert on its functioning. Meanwhile the focus on families as linguistic systems opened up to external influences from such as Bakhtin, Vygotsky, Foucault and Derrida focussed attention on wider systemic influences. Current developments cluster around an integration of systemic with attachment approaches, the 'open dialogue' movement and 'relational reflexivity'. Concerns have returned to wider systems and in particular Government and Health concerns with evidence-based provision, monetisation, and well-being.

CYBERNETICS PANEL
Professors Ray Ison and Gerald Midgley

A conversation.

THE LUDWIG VON BERTALANFFY MEMORIAL LECTURE:
GENERAL SYSTEMS THEORY: PAST, PRESENT AND POTENTIAL
Professor Peter Caws and Dr David Rousseau

Section 1:

Prof Peter Caws: General Systems Theory: its past and potential ("Science and System" revisited)

This presentation will have three parts:

1. What I took the original stimulus and purpose of GST to be, why I thought it important, and how I came to be involved in it.

2. The direction my own work took after my term as president of SGSR and how it diverged from the early program, in particular in its emphasis on the difference between system and structure and on the essential role of individual subjectivity in the latter.

3. The place of GST in the philosophy of science, especially in connection with the unity of science movement, and its potential for the organization of this domain.

In the first part I will say something about von Bertalanffy's General System (sic) Theory and the early debates on the topic, stressing the essential concept of isomorphism, with its rewards in following up parallel developments in different domains, and its risks and temptations in the projection of grand and all-inclusive systems. In the second part I will stress the importance of the concept of "relation" as underlying that of "system," and in particular the difference between relations as embodied in physical systems and relations as components of intentional structures that may or may not correspond to physical systems. And in the third part I will ask what light the concept of system can throw on our knowledge of the universe and its worlds (a distinction to be explained), and what are the risks of assuming tight isomorphisms between mathematical structures and physical systems, for example in cosmology and quantum mechanics.

Section 2:

Dr David Rousseau: General Systems Theory: its present and potential

This presentation will be in two parts.

In the first part, I will present a brief overview of present conceptions of what GST is, and the status of various projects pursuing its development. I will suggest that one version is the “real” GST, and that this GST does not yet exist.

In the second part, I will discuss the potential of GST in relation to the broader ambition of systems thinkers to build a ‘better’ world, reflecting on an ethical dimension in systems thinking that has been part of the systems tradition from the very outset.

I will present a ‘criteria framework’ for judgements about ‘betterment’, based on a range of universally recognised values and goals such as those expressed in the United Nations Declaration on Human Rights and the Preamble to the Constitution of the European Union, and show that these values can be arranged into a framework prioritised according to the ‘needs hierarchy’ developed by Abraham Maslow, a friend and colleague of von Bertalanffy. Using this schema, it is possible to show that specific Systemics bear particularly on the pursuit of particular needs/values in this schema, and that only some areas of need/value have adequate Systemics to draw on. I will argue that developing and leveraging GST is crucial for the development of Systemics that can support an effective pursuit of the remaining areas of need/value. In this light developing GST will be a key task towards fulfilling the ethical ambitions of the systems movement.

FRIDAY

ACTING BEYOND BORDERS: MADE POSSIBLE THROUGH SYSTEMS SCIENCE APPLICATIONS

Dr Yiannis Laouris - Future Worlds Centre, Cyprus

The application of systems science methodologies, and more specifically the science of dialogic design, will be reviewed using case studies from Israel/Palestine, Cyprus South-North, Europe, and other places. The talk will highlight how systems sciences can render people from all walks of life, working along with activists and domain experts, into systems thinkers capable of envisioning, designing and achieving sustainable systemic interventions. The talk will highlight the power of systems methodologies to break stereotypes, facilitate meaningful conflict resolution, and eventually create breakthroughs in peace and/or other social movements.

GOVERNING THE ANTHROPOCENE: THE GREATEST CHALLENGE FOR SYSTEMS THINKING IN PRACTICE? INCOMING PRESIDENTIAL ADDRESS

Ray Ison BScAgr(Hons) PhD

There is growing awareness of the term (metaphor) 'the Anthropocene', coined to describe a new period in Earth's history where the impact of Homo sapiens is having profound influences on the trajectory of life and the Earth's biophysical processes. This awareness creates with it the possibility of building new framings for how we think and act or of reenergising older framings that have remained sublimated.

Engaging with the concept and consequences of the Anthropocene brings to the forefront the challenge of how we humans govern ourselves i.e., how we respond to, and act in relation to, the biophysical world, other species and amongst ourselves. Discourses, practices and institutional innovations associated with cybernetic and systems thinking and practice (hereafter cybersystemics) remain sublimated in our governance arrangements (as the Limits to Growth experience testifies) but an historical moment may be upon us to explore and, where relevant, strengthen the ways of thinking, acting and governing that cybersystemics offers? But is the cybersystemic community of scholars and practitioners positioned to respond to the challenge?

Concurrent with the emergence of the Anthropocene as a framing of our circumstances, global conversations conducive to systemic change are emerging e.g., (i) Sustainable Development Goals – to replace the Millennium Development Goals; (ii) Resilience (see http://www.resalliance.org/); (iii) Planetary Boundaries and (iv) Future Earth (see http://www.icsu.org/future-earth). Importantly these discourses are refuting the classic model of sustainable development, of three integrated pillars — economic, social and environmental — that has served nations and the UN for over a decade, but distressingly the understandings, where they exist, of cybersystemics are weak and inadequate. Praxis capabilities in particular are poor.

My argument is that it is timely and responsible to foster a resurgence in cybersystemic thought and action in the cause of 'Governing the Anthropocene', to build stakeholding (including political support) within key constituencies and to generate potentially fundable international research agendas relevant to our common future. This is a challenge I invite you to accept by joining with me in initiating, in the coming year…and beyond…., a systemic inquiry into what we as cybersystemic scholars have to contribute to governing the Anthropocene. I doubt we can contribute significantly unless we jointly foster and build a revitalised discourse and network of relationships from the fragmented global community of cybersystemic scholars. Given current fragmentation this will require innovative in organisational forms and collaboration both internally in the ISSS and without.

List of Abstracts

(Paper numbers in parentheses)

2014 Abstracts

POSTERS

WORKSHOPS

Workshop Abstracts

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ADAPTING CO-OPERATED ROUNDTABLES TO ACCELERATE LEARNING AND CONNECTION IN OUR WORKPLACES

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The co-operated RoundTable is a user-friendly practice inspired by Boulding's Typology of System Complexity and research in education and systems methods. The RoundTable is designed to accelerate learning and build healthy community. It is a tool suitable for classroom- or meeting-facilitators in schools, workplaces, or other organizations. It is designed as a regular supplemental activity—perhaps weekly in classrooms, monthly in workplace meetings, and daily in weeklong programs, such as annual conferences or summer staff development programs. In busy schools and workplaces, the co-operated RoundTable is a 5/25 RoundTable--that is, five minutes for agenda delivery, and 25 minutes for participant reports—time distributed equally among all present. A resulting insight: "Just as we break the sound barrier when we travel faster than the speed of sound, we break the communication barrier when we hear thirty authentic viewpoints in thirty minutes."

Introduced in 1997, it has been followed in three communities: several fourth-grade classrooms for 14 years; the annual conference of the ISSS for 14 years; and in Los Angeles chapters of the American Society for Training and Development (ASTD LA) and the International Society of Performance Improvement (ISPI-LA) for two years. Thus, the transferability and adaptability of the RoundTable is promising.

Evolving the RoundTable further, the Triple Action RoundTable (a three-pronged approach) involves three simultaneous leverage points, or entry points in the social system. It is thus proposed to be at least three times more powerful in its ability to enhance or transform schools and workplaces. Key to the approach is the assumption that agency is within each individual group member. Thus, taking a spatial view of a social system, and with regard to entry points, the three prongs are seen as [1] bottom-up; [2] top-down; and [3] out-in-out.

The first prong is the RoundTable itself, a bottom-up approach. It develops mastery among participants and front line workers of a new satisfying practice in equal-turn democratic communication. The second prong is the TPO Thermostat Metaphor, a top-down approach. It develops mastery of a new way to lead among leaders and top management. TPO leaders understand the different natures of their organization's technical, personal and organizational domains (things, people and outcomes) and use a TPO Thermostat metaphor to view and manage their social systems. When the system (cf. thermostat) is Off, they plan. When the system is in On: Manual, they deliver resources and information. When the system is in On: Auto, they keep a watch and maintain the optimal working environment (cf. around 68 degrees) and allow participants freedom to work on their own. The third prong is the Triple Bottom Line (3BL), an in-out-in approach. In 3BL corporations, CEOs have financial, social and environmental goals. In schools, 3BL educators' goals are to advance students in their cognitive, affective and psychomotor development. The 3BL prong develops awareness among all system members of their current goals (in), invites ongoing reflection on more comprehensive goals or intended outcomes (out) and observed outcomes (in).

Workshop participants will receive a six-page handout: Four versions of 5/25 RoundTables and two supplements entitled the Triple Bottom Line and the TPO Thermostat Metaphor. The workshop is planned as follows (as both discrete and continuing events): 10-20 minutes: A brief summary of the RoundTable: its traits, benefits, and a question and answer period; 10-20 minutes: a RoundTable demonstration/experience; 20-40 minutes: participants will work in teams or individually to adapt a RoundTable Guide for the groups where they plan to introduce it back home. They will design a simple, adaptable RoundTable or a Triple Action RoundTable, each according to his or her own understanding and goals.

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2194

SYSTEM DUALITY AND THE INCLUDED MIDDLE

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System practice invariably involves characteristics which lie in between extremes. System theory must be consistent with philosophy, which is traditionally formulated with an excluded middle. We address this apparent incompatibility in the manner of Stéphane Lupasco and Joseph Brenner, where the declared binary nature of entities or processes presupposes an included middle. We identify this binary nature with the duality of individual and environment. What we wish to do is to bring all investigative endeavors under a generalized umbrella of entity and ecosystem, and to a subservience of semantics to context. We hope that this workshop will provide much-needed theoretical support for system practice in all areas.

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SYSTEM BASICS: EXPLORING THE RELATIONSHIP BETWEEN TRADITIONAL CHINESE SYSTEMIC THEORY AND PRACTICE, AND THE MODERN SYSTEMIC THEORY AND PRACTICE, FOR A COMPARATIVE LEARNING ACROSS THE BOUNDARIES

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The systemic thinking of the unification of nature and man has been the fundamental concept in traditional Chinese culture since around 500BC. The concept is also embedded in the teaching of Confucianism, Buddhism, Taoism, and Traditional Chinese Medicine. The traditional Chinese system theories under investigation include the Taichi yin-yang system theory, the Five systems theory of the human mind, and the Traditional Chinese Medicine differential diagnosis-cure process. In this workshop, the two streams of traditional and modern system theories are compared, and a mapping between them are investigated. The modern system theories compared include Viable system model, system dynamics, cybernetics, measurement system, soft and hard systems, anticipatory systems, General Theory of Systems, system of system process, Spirituality and Systems, Health and system thinking, monetary systems...

Taichi yin-yang system theory describes the relationship between any two entities (element/process) at any level of interest. It concerns the quantitative and qualitative changes between the entities. This is compared with causal loop diagram (CLD) in system dynamics which uses reinforcing loop and balancing loop. The observer is not specified in the theories, but the perspectives of the observer actually determine the entities, the unit of quantitative changes, and the ratio of qualitative changes.

The Five systems theory of the human mind is one of the importance concepts developed in the teaching of Buddha. The Five systems are: awareness, perspective, sensation, action and physical object. These five systems are able to describe the properties of the observer and the decision maker. The observer in anticipatory systems observes the world as a realized system (physical object) through structure and function (awareness), using a contextual system (perspective). It is commonly believed that the theory in physics is totally objective and is independent of the observers, except in the

field of relativity. However, it seems that the processes in the system of system process can be also arranged in the structure of the Five systems theory. For example, field process as awareness, storage process as perspective, flow process as sensation, and boundary process as action.

How hard or how soft a system is depends mainly on the flexibility of perspectives of the observer, but also on the flexibility of awareness, reaction to information, and the flexibility of actions. Viable system model cleverly separates the hard perspectives from the soft perspectives, and arranges them to the observers and decision makers at different levels. Therefore at each level of the Viable system model, flexibility of each of the five systems are fixed differently so that the daily routine work can be predicted and completed, while at the top level, the high flexibility allows the company to adapt to impacts from the environment.

The traditional Chinese medicine differential diagnosis-cure process is a practical systemic process that has been used daily for more than 2000 years. It is believed that the whole macroscopic-microscopic spectrum of systems is suitable. The system state identification involves three pairs of direction-forming spectrums. The Superficial and Internal spectrum gathers information between the boundary and the system. The Cold and Hot spectrum gathers information between the form and function, or matter and energy within the system. The Deficient and Excess spectrum gathers information between the environment and the system. Strategy can then be formulated to regulate and maintain the system. A standard accounting report can be analyzed using this diagnosis-cure process.

The aim of this workshop is to demonstrate a possible platform or bridge for a variety of systemic theories and practices, to explore the relationship between each other, to learn across their boundaries, and to form the foundation for future unification of system theories.

Keywords: Accounting System, Anticipatory systems, Buddhism, Causal loop diagram CLD, Confucianism, Cybernetics, Five systems of human mind, General System Theory, Health and system thinking, quantitative and qualitative changes, Spirituality and Systems, System dynamics, System of system process, Taichi Yin-Yang System Theory, Taoism, Buddha's teaching, Traditional Chinese medicine differential diagnosis-cure process, Unification of nature and man, Viable system model VSM.

Supporting Agencies: Ancient Balance Medicine Research and Education Fund Foundation Ltd

2210

THE IFF WORLD GAME: RESILIENCE IN A COMPLEX SYSTEM

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The IFF World Game is designed to enable people to share their thinking about sustainability and resilience in a joined-up way that avoids the narrowness of conventional approaches. A group play their way into the complexity and discover how shared intuitions can make rapid progress in appreciating a whole system view of community.

The game is based on a transdisciplinary world systems model that provided a representation of the global social-ecological system as an interconnected whole. It especially addresses issues of requisite variety and potential synchronous failure of the global system through neglect of boundary spanning shared thinking and challenges

participants to develop a shared 'connective wisdom' in response. Wn be viewed, by
The game role play can be viewed, by analogy, as a Three Act Drama. To enter the drama everyone takes on a role and responsibility in the game. Each node of the world game has a briefing on its current trends and its possible discontinuities or 'tipping points'. These become the basis for considering local concerns and then the ingredients of different scenarios of 'what if?'.
Act 1 is about engaging with a complex world, each player receiving a brief on their area of responsibility that will affect a shared area of concern.
Act 2 creates imaginative combinatorial scenarios of what might happen next.
Act 3 is a Wisdom Council to generate what our best thoughts are for the future and develops a collective picture and recommendations.
A full game takes a full day but in this workshop in the context of the conference a shortened version will be played in a way to give participants a good feel for the potential of this approach.

2229

USING SYSTEMS CONCEPTS IN EVALUATION DESIGN

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What is evaluation?

Evaluation is a field of inquiry used extensively to assess large and small scale social programs. Its recent history essentially dates from the major social programs launched throughout Europe and North America during the late 1960's and the development of what became known as "overseas aid". Its growth as a formal craft has been considerable; the American Evaluation Association alone has over 8,000 members and it is just one of nearly 100 national associations throughout the world. Some evaluation budgets run into the tens of millions of dollars.

As a form of social inquiry the evaluation field's distinctive feature is its focus on evidence informed judgments of merit, worth and value that are based on explicit criteria. As befits a diverse field, how those judgments are made and on what basis, using what evidence, from whom has given rise to a wide range of methodological theory, practice and argument.

The relationship between systems and evaluation

The systems field clearly engages in evaluative practice and many approaches within the evaluation field reflect many systems approaches. The two fields have much to gain from a closer relationship. However, it is only in the last few years that this has been acknowledged, primarily within the evaluation domain. A group of evaluators with links to the systems field have made substantial methodological contributions; the use of complexity and systems ideas are commonly explored in the field's journals, conferences and books. But it is still early days, and the depth of knowledge about systems ideas and how best to apply them to evaluation is in its infancy.

Workshop Details

This workshop is one example of how systems concepts can be used in evaluation design. in particular as part of the development of evaluation purpose (ie why evaluate), evaluation criteria (ie on what basis) and evaluation questions (ie using what evidence).

It is based on a set of generic elements of systemic inquiry that emerged from a meeting of evaluators and systems practitioners in 2006. This meeting that in addition to learning specific systems methods many evaluators would be attracted by broader generic

concepts with which evaluators are familiar and more likely to engage with. Those broad concepts were inter-relationships, perspectives and boundaries – topics much discussed and deliberated on in the evaluation field. However the systems field has some particular orientations around those concepts that can assist evaluators deliberate more profoundly on them. This workshop ties together the systems orientations around inter-relationships, perspectives and boundaries, with the evaluation concepts of purpose, criteria and questions. The workshop process was initially developed by the workshop facilitator with the Deutsches Evaluierungsinstitut der Entwicklungszusammenarbeit (DEval), the German Institute for Development Evaluation, and refined through work in the UK, the USA and New Zealand. It also forms the core of a recent book that considers the broader issue of intervention design using systems concepts – Wicked Solutions : A Systems Approach to Complex Problems.

How is this relevant to ISSS?

The workshop was initially designed to introduce systems ideas to evaluators and help them understand how to apply those ideas to their practice. Although the basic framework of the existing workshop will be kept (see accompanying file) the emphasis will be in introducing some evaluation ideas to systems practitioners. It will also be an opportunity for systems practitioners to explore, comment on – indeed evaluate – the value of the three generic concepts.

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COMBINING "TRADITIONAL" KNOWLEDGE WITH COMPLEX ADAPTIVE SYSTEM UNDERSTANDING OF HOW THE WORLD WORKS

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The field of Complex Adaptive Systems (CAS) presents us with many notions of how the world works that are quite at odds with research findings in traditional social sciences. Many examples of such concepts can be found. To name but a few: attractors, strange attractors, fractals, phase transitions, logistic maps, power laws, emergence, and scaling with system growth. These and many related CAS concepts have a rich history in the social sciences. However, the "traditional" research and the CAS work tend to be oddly unconnected.

Some examples of the disconnect: Housing discrimination: An agent-based model can show how neighborhood segregation can take place based on a few simple rules for families in a neighborhood, e.g. Stay if two of your neighbors are your color. Move otherwise. But does that mean that the psychology of perceived similarity, or bank lending policies, have no role? Federal oversight: Federal regulatory agencies swing in pendulum-like motion between extremes of cooperating with industry, and coercing them. One could conceptualize this as an attractor, and simply assume that things are happening in the world that result in the attractor's shape. Or, one could look at factors such as government policy, occurrences of high profile accidents, and leadership style as predictors of how the regulatory agency will behave. Gun violence: The intensity of gun violence in the U.S. can be tracked and plotted, showing a power law distribution. That shape is useful in understanding the probability and magnitude of occurrences. But such a plot says nothing about the role of mental health in violence, the sociology of gang formation, or the impact of gun control legislation. Many other examples can be brought, but these three should make the case.

The purpose of this workshop is to work toward an understanding of how the "traditional" research and the CAS view can be combined. The combination can work two ways: "CAS" → "tradition", and tradition" → "CAS". An example of the former is evident in my own work. I am heavily involved in evaluating human factors based safety programs. We use a traditional evaluation design, combining qualitative and quantitative data in a mixed-methods, quasi-experiment. The research is based on a traditional logic model. We have noted that the program may be losing cachet among the workforce because it is not seen as successful. Our initial reaction was to look at the data on outreach and note how weak the communications plan was. This is true. The communication plan does need to be improved. However, we are beginning to suspect that the success of particular corrective actions is power law distributed. Thus no matter how good the communications, widespread perception of success may be suppressed. We did not have this insight previously, and it is affecting how we interpret our data and what recommendations we are making.

As an example of going from "tradition" to "systems", consider the example of adapting a best practice, say in a health care or educational setting. There are whole libraries of research the variables that explain the pace of change. There is also a body of research that models innovation adoption in CAS terms. What is harder to find is a combination of the two. For instance we know the characteristics of innovations that promote their spread (e.g. ability to test before wide scale implementation, familiarity, and the like.) Those innovation characteristics, however, do not play a prominent role in the CAS activity that is trying to explain adoption. During the workshop I propose to provide a few cases of the type outlined above, showing the "traditional" view, the CAS view, and possibilities for combining the two. Participants will then be invited to discuss their own work as it relates to how the two perspectives might be combined.

Transferability and Adaptability

In the above description I deliberately chose a variety of CAS concepts and domain applications for the purpose of illustrating the range of possible applications. Beyond the examples, there is the intellectual history of CAS. There is scarce an aspect of social science that has not seen attention by CAS researchers and theoreticians. In all cases that I know of however, (save Economics and Population Ecology), the CAS view and the traditional view are not tightly connected. In all cases where I have personal expertise, I have seen rich opportunity for bringing the two together.

Sources

My own research has been exploring the CAS/traditional view relationship in one particular area – program evaluation. In particular our group has been interested in the evaluation of the adoption of best practices. Two publications present the work we have done:

Parunak H. V.D. and Morell, J.A. (2014) Emergent Consequences: Unexpected Behaviors in a Simple Model to Support Innovation Adoption, Planning, and Evaluation in Kennedy W.G., Agarwal N. and Yang, J. S. eds. Social Computing, Behavioral-Cultural Modeling, and Prediction 7th International Conference, SBP 2014 Washington, DC, USA, April 1-4, 2014

Morell, J.A., Hilscher, R., Magura, S. and Ford, J. (2010) Integrating Evaluation and Agent-Based Modeling: Rationale and an Example for Adopting Evidence-Based Practices Journal of Multi-Disciplinary Evaluation, Vol. 6, No 14, 35 - 57

While not as directly related, the work I have done on methodology for evaluating programs with unintended consequences is also relevant because various CAS

perspectives are woven into my ideas about how relatively common and prosaic evaluation methodologies need to be configured to deal with “evaluation surprise”. See:

Morell, J.A. (2010) Evaluation in the Face of Uncertainty: Anticipating Surprise and Responding to the Inevitable Guilford Press N.Y.

While not a formal publication, I have also produced a long and detailed blog post on the application of CAS in the field of Evaluation. As with much of my other work, the emphasis is on how garden variety evaluation can be enriched by concepts from CAS. See: Complexity is about stability and predictability

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EXPLORING LIVING SYSTEMS AWARENESS THROUGH MOVEMENT

Barbara Widhalm

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How can we fully experience the organizing principles of life, engaging our bodies, hearts, and minds? And how can tapping into “living systems awareness” help us feel better prepared as change agents in an increasingly unpredictable world? This workshop is an invitation to participate in a playful hour of experiencing the ISSS community AS an adaptive, vibrant, and autopoietic living system. The workshop is based on an experiential approach called Biodanza. Biodanza, which means Dance of Life, integrates music, movement and authentic interactions to evoke a felt sense of being fully alive and alert in the here-and-now. This system originated over 40 years ago in Chile and Brazil and has spread since then to five continents. The Biodanza system is grounded in living systems theory and was particularly inspired by systems scholars Varela, Maturana, and Capra. An organizational development approach Biocentric Systems in Organizations, based on the same system, is being utilized in Europe and Latin America to help organizations become more fully aligned with their inherent potential as living-learning systems and vibrant communities of practice.

Come experience living systems awareness at ISSS! In this session, the workshop facilitators will first review the main organizing principles of living systems and then guide participants through a sequence of movement exercises with music. No dance or prior movement experience is necessary. This is an opportunity to playfully experience the ISSS community AS a vibrant, highly interconnected, living system and carry that felt sense into the conference as a whole.

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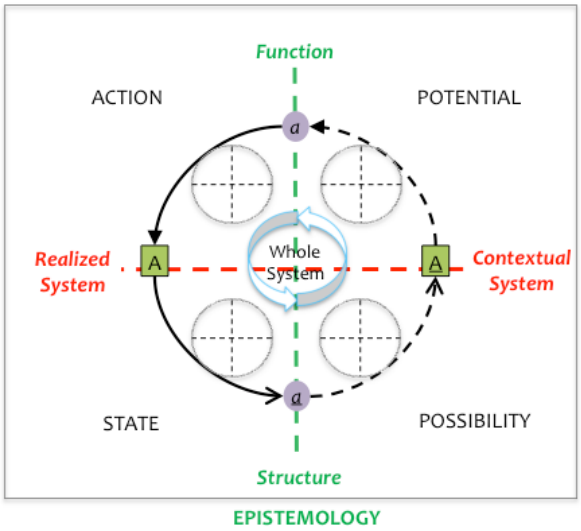
RELATIONAL THEORY WORKSHOP

Robert Rosen (in Spirit); Judith Rosen (via Skype); John Kineman (in Person)

Robert Rosen was a theoretical biologist who developed a foundational set of interlocking scientific theories, including mathematical models, to account for the difference between living and non-living systems. His scientific work talks about how nature is organized, how living systems are organized, and how life manifests itself within nature. His work suggests that understanding these organizational entailments, which are actually relational entailments, can teach us something new about physics and help us build more accurate models of complex interacting systems like the biosphere. What were his ideas? How could he make such claims? And how can we use this information to further develop science and increase the potential for public benefit and health?



In 2011 Dr. John Kineman, working closely with Judith Rosen, Robert Rosen's daughter, developed a synthesis of Rosen's several lines of reasoning along with basic ideas from Physics and Ecology. The result was a general theory of nature that may realize von Bertalanffy's ideal of a "General System Theory". The synthesis goes by the name "R-theory" after "relational" and "Rosen", and to clearly identify it as a further development of Rosen's original ideas in "Relational Biology". Since 2011 the theory has been refined and tested in a number of disciplines, and found to reveal startling results. R-theory now provides a clear definition of what it means for a system to be 'whole', and therefore may give important clues about sustainability and resilience. It also extends Rosen's description of life and predicts, from its category mathematics, the three major categories of life we observe. The theory has also been successfully tested for its cosmological implications, and found to correspond to a revolutionary new theory of "scale expansion". At the recent 'conversation' of the International Federation for Systems Research, the R-theory four-quadrant holon was recognized as corresponding to many empirically and intuitively determined methods in systems research, perhaps underlying them all. The meta-system causal schema shown above transcends mechanistic and hierarchical concepts of causality to include the effect of contexts. In doing so, it accounts for 'bottom-up' causation traditionally associated with the material world and increase in entropy, with 'top-down' causation by which systems become organized. It allows us to relate ontology and epistemology and thereby provides a means of analyzing systems in terms of self-similar wholes. In other words, if we imagine the separate mechanisms and material parts of a system inside some container, R-theory allows us to understand the constraints imposed by the container. Furthermore it allows us to study systems in which the container and the parts determine each other. That condition turns out to underlie all natural systems, except to the (often considerable) extent that they have formed enduring material elements. We thus can see that relational theory looks at the origin of nature oppositely than mechanistic theory, beginning with complex whole relations and then explaining how systems originate and become reduced to material realizations and elaborated into even more complex living entities. Considerable work remains to be done in rewriting our previous theories and models into this new and more natural worldview, and testing the results. Revolutionary as it is, considerable work is also needed to decide the extent to which Systems Science as a field can embrace it, or perhaps already does.

While these claims are obviously grand and impossible to prove in a single workshop (or perhaps many), we can gain an understanding of the new view through examples, models, analogies, and applications. In contrast to more standard scientific models, the relational view is actually more parsimonious in the sense of being a more elegant description of nature, in fact closer to our natural intuition. In fact, that association with more natural human thinking becomes clear in the study of natural-living modern and ancient societies throughout recorded history. A fascinating study is beginning about the

human history of holistic thinking, which appears to have existed in very sophisticated form prior to 1900 BCE, after which the world plunged into an extreme form of dualism.

While R-theory appears to offer a robust explanation of how natural systems of all kinds are organized – thus saying something new about physics as well as biology – confidence in it as a general causal structure or model of the universe can only be gained by considerable application and testing. And to accomplish that, it must be learned and applied correctly. Although a well-developed education program is really needed now to extend the use of R-theory, we are still at beginning stages where teaching methods and tools are being developed and curricula written. Periodically we offer workshops to explain the basic concepts of both Rosen's original ideas and the over-arching, more recently synthesized R-theory. Our strongest desire is to reach a point where we can engage graduate students in significant relational science research, so that they will carry the work forward.

This workshop is not for traditionalists unless they want to radically expand their scope and vision. It is as 'out of the box' as any intellectual experience can be (not denying there are other, perhaps more profound, ways to be 'out of the box'!). We find a solid basis for guided evolution, explanation of organizational patterns in cells, organisms, and ecosystems; a clear characterization of consciousness, Being and identity; an architecture for new informatics; and even a new model for space-time and the cosmos. But in this initial stage of development, perhaps the strongest need and opportunity for applying the theory lies in the human, social, and ecological sciences, where humanity is facing crises clearly attributable to our lack of understanding of whole systems. In fact, one very promising avenue of exploration is into 'crisis science' which shares all the characteristics imagined of holistic science. Thus, in contrast to how difficult it can be to promote systemic thinking otherwise, it emerges instantly during a crisis. Recognizing this important fact, we can then ask how to trigger that thinking earlier, to think in anticipatory modes and perhaps prevent crises.

This Workshop will be divided into two parts, one conducted via the Web remotely by Judith Rosen, with locally facilitated discussion, and the other conducted in person by John Kineman. The major focus of the first part of the workshop, run by Judith Rosen, will be on concepts of relational entailment. Many people have trouble visualizing the difference between the mainstream view of how causality works and the relational view. Specifically, we will make use of a common game called Sudoku, which is actually a useful demonstration of how relations between “things” are not only important but can be as much of a driving force, in terms of outcome, as any material phenomenon. This part of the workshop will serve as a fun but hopefully informative introduction to the deeper scientific part of the workshop, run by John Kineman.

With a solid foundation in Robert Rosen's system thinking, R-theory, in the second part of the workshop takes us on an amazing journey where we see rather surprising and delightful implications. Releasing many artificial constraints that have been placed on our minds, we will learn to dance with reality, perhaps even to fly. The equipment you will need for this journey is only your mind (regardless of the brain), removed from its present container (not the skull, but its philosophical container). R-theory changes our entire concept of reality into one in which the foundation of all things is not material but relational. Indeed, the complex relational nature of the universe is at the root of both its origin and its interactions. From this relationally complex foundation we can easily see how mechanical systems are fractions of a whole complex system and how living systems are higher order complex wholes. We thus find a means for unification of science as well as a deep understanding of human cognition, intellectual selfhood, and imagination. By providing a theory of whole systems it suggests plausible approaches to

understanding sustainability and anticipation, as we move into a new era in human evolution that will likely depend on that understanding. To see our present and that future in proper perspective, we will even take a journey back 5000 years to ancient India and similar concepts of the 'non-dual' whole.

Come experience with us an expansion of thought and mind and see what it makes possible if applied to your own work.

2236

ACTIVITIES ANALYSIS: AN ETHNOGRAPHIC METHODOLOGY FOR A SYSTEMS APPROACH TO PROGRAM IMPLEMENTATION AND EVALUATION

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In the 1960's, anthropologist Ward Goodenough developed activities analysis as an ethnographic tool for analyzing the systemic connections in the human activities related to community development, and applied this in an international, cross-cultural context (Goodenough 1963). Lieber has applied this approach to the analysis of fishing in social and ecological context on a Polynesian atoll (Lieber 1994). Subsequently, we adapted this approach to the evaluation and implementation of social programs, and have found it particularly useful in complex projects involving cross-organizational collaboration and/or when program participants are developing and changing goals and associated activities as their work unfolds (Pinsker and Lieber 2005). Analysts who approach such "messy" programs or projects in a traditional, more linear way often do not know where to start. We have adapted Goodenough's activities analysis for this purpose. Conducting evaluation or action research with the activity as the analytical unit consists of two stages of data collection: (1) a detailed description of the features of the activity, activities, or sets of activities, one by one and (2) a detailed description of the relations between activities observed. Goodenough has provided a handy outline of features of activities as a minimal listing that can be expanded (or contracted) according to the particular setting. These are as follows (Goodenough 1963, 330-331): Purpose, Procedures, Time and Space Requirements, Personnel Requirements, Social Organization (Management), and Occasions for Performance.

Similar to many other systems approaches to human activity (for instance, the work of Gregory Bateson) activities analysis focuses on identifying constraints that shape the possibilities for processes and outcomes within a system of interactions. The analysis begins with specific activities and proceeds to the examination of systemic relationships among them. The first step is the identification of the specific constraints that shape that activity. Any of the features on Goodenough's list can be a potential constraint on the activity. As the constraints on specific activities become clear, it is often the case that several activities share the same sets of constraints, forming a category that may (and usually is) recognized as such by the people observed. The next step in empirical generalization from constraints on specific activities and categories of similarly constrained activities is the constraints that the conduct of one activity places on other activities. That is, the relationships between activities are often mutually constraining. Multiple activities can draw on the same resources creating potential conflicts (an example of feature overlap), or one activity can be necessary (instrumental) for the performance of another, or complement the performance of another through relationships between activities features. The methodology provides ways to identify

feature overlap, feature complementation, and instrumental relationships among activities, all of which enable the identification of specific leverage points for intervention in the analyzed system, enabling, for instance more effective program implementation as well as making predictions about program sustainability.

Relevance of Activities Analysis for Systems Theorists/Systems Thinkers

Goodenough's activities analysis, though developed independently of it, bears some similarities to the Activity Theory and Cultural Historical Activity Theory developed by Vygotsky and Leont'ev, which are considered by some systems practitioners to be systems approaches (Verenikina 2010, Bob Williams 2010). However, because activities analysis comes from an anthropological and ethnographic base, rather than a psychological or social psychological one, it starts from the context of the social group rather than adding that on to an individual-based perspective, which has some advantages when group outcomes or consequences are the focus of analysis. Activities analysis is a very practical methodology: both in terms of using a common-sense approach to systems analysis that does not require computer assisted modeling or other information technology, and also in terms of its ability to contribute to social program development and sustainability in a broad and multi-cultural range of contexts. We think that activities analysis should appeal to any systems thinkers concerned with such real-world applications, such as organizational development professionals working from a soft systems perspective, or those who draw on the systems-dynamics based work of Peter Senge or the cybernetics-based work of Stafford Beer. Furthermore, the anthropological and ethnographic roots of activities analysis place it in a thread of development of systems theory that also includes Margaret Mead and Gregory Bateson. Activities analysis should be of interest to those who want to know how anthropological methods can be applied to systems perspectives on social problems.

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INCUBATING SERVICE SYSTEMS THINKING: NEW FRAMES FOR COLLABORATING ON A PATTERN LANGUAGES FOR SERVICE SYSTEMS

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This workshop aims to advance a new cross-organizational community on "Service Systems Thinking". This label is proffered for an emerging body of work that: (i) builds

on social systems thinking (i.e. socio-psychological, socio-technical and socio-ecological systems perspectives) to advance a transdisciplinary appreciation of service systems science, management, engineering and design; (ii) explores opportunities to enrich Alexanderian patterns and categorized pattern catalogs into a generative pattern language; and (iii) collaborates on new platforms, moving from inductive-consensual wiki pages to a multiple-perspectives (federated) wiki. The promise of the original SSMED (service science, management, engineering and design) initiative championed by Jim Spohrer at IBM Almaden was to bridge organization silos in the development of knowledge for the new economy. Attendees at the members attending ISSS 2014 are welcomed to join in this workshop to appreciate the breadth and depth of the domain, and assess their interest in becoming an author and/or contributor to the collaboration. The service systems thinking community can learn from work organization methods, tools and licensing well known to the open source community. First steps in the collaboration can follow the incubation patterns demonstrated by the Apache Software Foundation and the Eclipse Foundation. This initiative has been initially endorsed by leaders in the International Society for the Systems Sciences (ISSS), International Council on Systems Engineering (INCOSE) and the International Society of Service Innovation Professionals (ISSIP).

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BOUNDARY CRITIQUE, MARGINALIZATION AND INCLUSION

Anne Stephens and Ellen Lewis

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Building on Anne Stephens' work in Australia developing and applying Feminist-Systems Thinking (FST), Ellen Lewis conducted FST workshops with broad stakeholder groups in Nicaragua. Participants included rural farmers, university students and professors, volunteers, staff, administration, and boards of directors representing micro and small businesses, dairy cooperatives, learning centres, women cooperatives, international development agencies and universities. The workshops invited participants to analyse their own businesses through five lenses: gender, nature, marginalized voices, social change and system analysis. Participants explored what current practices are, how they should be, what steps need to be done for improvement and whether it's a priority.

See how the FST lens could contribute to your project. Participate in some of the activities used in the Nicaraguan and Australian studies. Take home new techniques to embed FST research into your practice and don't miss anyone or anything lying on the edge.

2366

PRINCIPLES FOR LIVING SYSTEMS SCIENCE OF GROUPS AND SOCIETIES

Jim Simms

Two recent developments provide the foundation for a group and society science. These developments are an extension of the principles of quantitative living systems for cell, organs and organisms. Knowledge and information are universal phenomena of life and can be quantified. Units of measure have been developed for knowledge and information that are equivalent to the centimeter, gram and second (cgs) natural science measures.

A universal phenomenon of groups is sexual reproduction. The determinants of sexual reproduction phenomenon have been identified and units of measure developed. The principles can be extended to complex group behaviors such as protection and training of offspring and group protection. Fundamental measures for humans have been developed by scaling from the universal measure of energy to the common measures of energy. It is predicted that the principles can be used to develop a science of groups and societies equivalent to the extant natural science.

2377

YES WE CAN GOVERN CALIFORNIA, JERRY BROWN! (EDMUND G. BROWN, JR.'S FINAL FIVE YEAR PLAN?)

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Welcome to the 21st century. The only solution to bureaucracy is de-centralization.

Counties were originally the governed territory of a "Count," a single person. The Sheriff evolved to enforce the laws. Up until FDR created the New Deal in the 1930s, county government was mostly about managing agriculture. Over the course of the 20th century, the federal and the state government have added layers and layers (and layers, and…) to a county's responsibilities, as well as invented new layers of regional government that are intended to by-pass county and city jurisdictional boundaries. Now the complexity of thousands of special districts of government is the problem.

This is a plan to re-organize California, focusing as much of the governmental responsibility as possible at the level of a "community" of around 10,000 people. The idea is to minimize the need for bureaucracy at the state and regional level, because the quality of the information at the community level is so clear that people at the local, regional and state levels can easily see what the problems are, and respond to their causes.

2381

SYRIA AND UKRAINE AND OTHER CURRENT CONFLICT SITUATIONS, DO WE AS SYSTEM PEOPLE HAVING ANYTHING TO CONTRIBUTE?

Dennis Finlayson

The current conflict in Syria has focused attention even more intently on the situation in the region. Other conflicts continue in Iraq and elsewhere, some of which date back many decades whilst others have reignited much more longstanding religious and ethnics divides. Similarly based conflicts persist in other parts of Asia and parts of Africa have experienced festering conflicts seemingly stemming from struggles to control natural resources. More recently the conflict in Ukraine has brought international attention back to Europe especially with the very recent downing of an international flight to and from countries remote from the conflict. Things seem to be going wrong and the 'systems' established at the international and regional levels do not seem to clear how to respond. Do we as 'systems thinkers and practitioners' have any concepts e.g. (requisite variety) or innovative vocabulary or models of 'conflict re-solution' to offer to those charged with addressing these situations or are we mute when challenged by 'real world' issues?

Poster Abstracts

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VALIDATION OF SYSTEMS MODELS IN PUBLIC HEALTH RESEARCH

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The application of systems methods, notably system dynamics modeling and agent-based modeling, to the understanding of public health problems (e.g., alcohol and drug abuse, chronic disease, obesity, tobacco use, and violence) has grown considerably in the past decade. System methods are seen by many of their advocates within public health as complimenting traditional behavioral and epidemiological research methods, while others see them as a fundamentally different way of understanding and explaining public health problems. Those who see the methods as complimentary often use empirical data from studies employing traditional methods and statistical analysis (e.g., multiple regression of survey data) to validate the output of simulation models. Alfred Korzybski famously stated: "The map is not the territory," yet this predominant approach to model validation in public health research assumes traditional empirical methods and statistical techniques capture the "territory" with such accuracy that they can be used as a yardstick against which to judge the performance and adequacy of a model.

The rapidity with which systems methods have been adopted within the field of public health has meant that some of the underlying philosophical issues regarding the use of such methods have not been explored and debated in much detail. One such issue is validity. As noted above, the dominant, if not exclusive, approach to model validation within public health is an objectivist approach, one in which the validity of a model is judged in terms of how well it resembles or corresponds to data from an analytic study. Other philosophical problems with such an approach include the assumption that a system is closed, its underlying either-or approach to model performance, and the assumption that correspondence between the data and the model output demonstrates the "truth" or "reality" of the latter. As in other fields of applied research in which modeling has become popular, this tendency to equate a model's correspondence to data with the model corresponding to reality is especially pronounced when the goal of the modeling is to inform public policy.

In contrast to the objectivist approach which dominates model validation in public health research, it has been pointed out in the broader literature on modeling that both model output and empirical data are laden with inference and assumptions, and hence neither should be considered "true" or even an accurate representation of the processes occurring in a real system. The present poster and paper discuss specific examples from the public health literature which illustrate the problems with an objectivist approach to model validation premised on the idea that statistical analysis of data provide a superior representation of "reality" against which the validity of an inherently inferior model can be judged. The examples, which use system dynamics and agent-based models, demonstrate that, rather than empirical data being superior to the model, each is better considered as simply capturing a different aspect of a real system. Beyond this, we show that the assumption that empirical data are superior and provide a gold

standard against which the model can be validated is often misguided, as the data are fundamentally flawed through low response rate, ambiguously worded survey questions, and the use of methods for scoring and categorizing survey data that are crude at best. At the most extreme, these threats to the validity of the empirical data produce results generated through statistical analysis that may bear only a vague resemblance to the real system that they purport to capture and the assumption that they can be used to validate system dynamic and agent-based models is misplaced.

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TOWARD A SYSTEMS TYPE STRUCTURE

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A system can only be understood holistically. If our goal is to understand systems we must develop holistic descriptions. That conclusion seems inescapable.

Systems occur naturally in hierarchies and interact with a context consisting mostly of other system hierarchies. Systems reside in large, highly interoperating networks, meaning that a truly holistic view of a system has no clear outer limit. The great complexity and scope of such systems present a barrier to reaching a holistic view. Surmounting this barrier should be a goal of systems thinking.

Starting from a system of interest and working upward and outward is not the only possible approach. A system influences its parts as well as vice-versa. Complementary to a bottom-up approach from a system of interest is a top-down approach starting with a large encompassing system.

All systems are part of the universe, about which much is now known. A top-down approach could start by examining the universe as a whole in terms of the types of systems it contains and how they are related. Indeed, the universe constitutes the ultimate whole. Starting with the whole, even a distant and immense whole, seems especially appropriate when seeking wholeness.

Of course, the universe can never be described in full detail, but it could be described from a systems perspective in a way that would facilitate all other system inquiries. The universe embodies the general architecture and ground rules for the integration of all systems. Eventually top-down development and the many bottom-up inquiries would meet, enabling pieces of the puzzle to fall into place.

Much valuable systems knowledge is available but it is highly fragmented. Unification is the only remedy for fragmentation. A single top-down approach would provide unification in the form of a common framework and dialect into which all other knowledge can be fit and made coherent. The universe is coherent; otherwise science could never succeed. The fact that our descriptions are not coherent must be the fault of our descriptions not of reality. Hence, in principle they can be fixed and a common coherent description developed.

This paper addresses a universal holistic view through a global system type structure. The type structure is represented in the form of a Unified Modeling Language (UML) generalization-specialization hierarchy, a well-proven approach.

System thinkers have repeatedly called for a comprehensive system classification, but to my knowledge none exists. The notion of a system is extremely general and so has a great many variants. Many definitions of particular system types and partial type structures exist, but no comprehensive, coherent structure. A coherent universe must allow a coherent description given the right approach; here we consider one. A global

system type structure is an incomplete and insufficient holistic description but it provides a good starting point.

This paper addresses both a preliminary system type structure and the kind of approach needed to develop and perfect it. It also calls for collaboration to go forward with the project.

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A PROPOSED THEORETICAL FRAMEWORK FOR A SUSTAINABLE MANUFACTURING SYSTEMS DESIGN METHODOLOGY

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Understanding the systemic relations of sustainability behaviours in manufacturing systems is paramount to advance the emerging field of sustainable manufacturing. Current efforts to advance sustainable manufacturing either focus on the environmental, economic or social weltanshauungen separately or at the very best combine two out of three. From a holistic perspective, this is not enough. In addition, we posit that regardless if the manufacturing system exist or not, Sustainable manufacturing system (SUMS) needs to be designed from the most basic organizational structure: it's costing system. Because of that that the proposed design methodology seeks to begin using costing methods by linking the economic, environmental, and social domains of sustainable manufacturing with systems thinking principles. Costing methods will assist decision makers to align and assess what changes need to be made structurally within their companies in order to implement sustainable manufacturing practices. The approach to develop this methodology will follow an active engagement with metals manufacturers (especially SMEs) due to accessibility and recent interest in the Pacific Northwest metals industry in sustainability efforts.

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A GENERAL SYSTEM THEORY FOR ANY PARTICULAR PERSPECTIVE OF THE OBSERVER

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The search for a set of basic components and their relationships to one another within a certain field has been the work for scientists. System thinkers try to find a basic set of components and relationships that can be applied to all fields of science. System thinking enables the view of a big picture in a holistic perspective, so that all components, relationships, and transformations can be clearly understood by the observer. In any system, an observer is required in order for analysis occur. In physics, speed and time do not mean anything without the frame of reference of an observer. The frame of reference of the observer determines the perspective of the analysis of the system. An observer can try to analyze a system objectively, however, being objective only means that the analysis is agreeable by a certain population of observers. There will always be a larger population of observers and hence the analysis is always

relatively subjective. Objective analysis with either "no perspective" or "all perspective" is impossible, any analysis will instead take on one of an infinite number of possible perspectives.

A general system theory must include both the system and the observer decision maker. Therefore, it must include at least one particular perspective. Some of the existing fundamental theories in different fields are should have some similarities including set theory in mathematics, relativity in physics, differential diagnosis-cure process in Traditional Chinese Medicine, Taichi Yin-Yang theory in Taoism, and Five Aggregate Systems theory in the teaching of Buddha. The systemic thinking of the correspondence between nature and human has been the fundamental concept in traditional Chinese culture since around 500BC. The concept is also embedded in the teaching of Confucianism, Buddhism, Taoism, and Traditional Chinese Medicine.

Taichi yin-yang system theory describes the relationship between any two entities (element/process) at any level of interest. It concerns the quantitative and qualitative changes between the entities. The Five Aggregate system theory of the human mind is one of the importance concepts developed in the teaching of Buddha. The Five Aggregate are: awareness, perspective, sensation, action and physical object. These five systems are able to describe the properties of the observer and the decision maker.

How hard or how soft a system is depends mainly on the flexibility of perspectives of the observer, but also on the flexibility of awareness, reaction to information, and the flexibility of actions.

The traditional Chinese medicine differential diagnosis-cure process is a practical systemic process that has been used daily for more than 2000 years. It is believed that the whole macroscopic-microscopic spectrum of systems is suitable. The system state identification involves three pairs of direction-forming spectrums. The Superficial and Internal spectrum gathers information between the boundary and the system. The Cold and Hot spectrum gathers information between the form and function, or matter and energy within the system. The Deficient and Excess spectrum gathers information between the environment and the system. Strategy can then be formulated to regulate and maintain the system.

With this proposed GST, we are expected to find similarities with a variety of systemic theories and practices, where we can then learn across their boundaries.

Keywords: General System Theory, Taichi Yin-Yang System Theory, Set theory, Relativity, Traditional Chinese Medicine Differential diagnosis-cure process, Buddha's teaching, Differentiation

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HEALTH AND SYSTEM THINKING - A HOLISTIC HEALTHCARE PROTECTION PROGRAM

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Ever since the success of the first antibiotics against TB, the battle of human against germs and virus falls into the favor of human. Just when human thought that we are in complete control, we are amazed by the growing difference between the speed of discovering new antibiotics and anti-viral drugs and the speed of the breakout of new germs and viurs like SARS and HxNx.

Traditional Chinese Medicine is based on the Taichi Yin-Yang theory that was published 2000 years ago, which has been thoroughly developed through time. TCM employs the

Differential Diagnosis-Cure process to balance the five different sub-systems and the eight components of each system in human body. The remarkable results in the battle against SARS is supported by the guidance of this ancient theory, rather than a particular effective Chinese herb. The research of this success could only be understood through the viewpoint of system theory.

Reductionism was the major scientific view before world war II, its development leads to industrial revolution and modern medicine. Traditional medicine like Traditional Chinese Medicine, Ayurvedic Medicine, Homeopathy, Naturopathy, and Western Herbal Medicine was then considered as alternative medicine because they are seem incompatible with reductionism and allopathic medicine. However, reductionism was found to be an incomplete scientific view after world war II and a more holistic scientific view was developed namely system theory.

Systemic thinking is to consider both the system and the environment when analyzing or maintaining a system, or its environment. When analyzing a particular component within a system, all other components should be considered as well but different importance ratio is allowed. Traditional medicine has been analyzed with the incomplete scientific theory for logical explanations of its medical theory and practice, resulting in confusion and misunderstanding. This workshop will demonstrate the application of system theory to investigate the holistic nature of a particular traditional medicine namely Traditional Chinese Medicine. It is believed that all other traditional and alternative medicine could be better understood in this holistic scientific view of system theory.

The Taichi Yin-Yang system theory was developed when combining both the traditional Chinese thinking and the systemic thinking. Taichi is considered as the organizational force in the universe, and the Yin-Yang combo is considered as the information gathering process, the current state determination process, and the steady state regulation process. According to the Taichi Yin-Yang system theory, the Taichi(Yin, Yang) structure should be used in all analysis. The possible analysis of health system are:

- Health(physical, mental) - the Cold-Hot spectrum
- Health(chronic, acute) - the Deficient-Excess spectrum
- Health(external hygiene protection, internal healthcare protection) - the Superficial-Internal spectrum

Healthcare is our first system employed to maintain human. A systemic maintenance program called Traditional Chinese Medicine Healthcare Protection Program is introduced, which is simple and effective for promotion in the community. Helping the poor with money will never be enough, but helping the poor to make money themselves is a more permanent solution and may even have a positive feedback to the helper. A internal healthcare program should teach the community how to take up the responsibility of their own health in a simple and effective manner. The Traditional Chinese Medicine Healthcare Protection Program composed of three components:

1.the TCM diet on how to choose food from the Cold-Hot food spectrum,

2.the Middle-way exercise therapy on how to regulate our body and Chi (Qi) from the fully Open-Close movement spectrum,

3.the TCM 24h healthcare lifestyle on how to use our health wisely for work and fun from the Human-Environment spectrum.

Keywords: Middle-way exercise therapy, Healthcare Protection Program, Taichi Yin-Yang system theory, Traditional Chinese Medicine, Reductionism, System maintenance, Heath and System thinking

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ENVIRONMENTAL FACTORS ARE KEY IN UNDERSTANDING THE FOOD SECURITY PHENOMENON IN THE DHANKUTA DISTRICT OF NEPAL

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This poster elaborates on the grounded reality of environmental narratives while engaging with rural communities with the purpose of studying food security and aid intervention outcomes in the Dhankuta District of Nepal. In Nepal, approximately eighty percent of people live in rural areas and are involved in single household farming, utilising small to medium (0.95 ha in 1995) size farm lots. The food security concerns for these farming communities are exacerbated by entrenched poverty and a history of international development aid and as a developing nation has forged bilateral relationships with India and China in particular, and more developed nations. The role of external aid in the context of food security and rural livelihood is critical and requires better understanding. At present food security concerns have been addressed in other jurisdictions which generally focus on issues of increasing crop/farm yield through external inputs; specifically seeds, agrochemicals and national policies. Translation of food security concerns from earlier studies to the Nepali environment is not straightforward and requires contextualization. The research presented here followed a Grounded Theory and Systems Thinking Approach. The intent of the research is not to test the hypothesis or the theory, but rather to build a theory through theoretical sampling and a constant comparative method. Reflectivity and rigour were a crucial aspect of this research, allowing ample room for theory to emerge from the data. The Australian National Ethics Application was as a requirement for conducting research with human beings and approved by Central Queensland University Human Research Ethics Committee. The interviews were undertaken at both individual and group levels. Focus group meetings were also organized in order gain insights into the bigger picture, and to gain a sense of the community voice. All of these events were captured through recording, photographs and memo writing. Grounded Theory is an iterative process with constant reflectivity and rigour. Core ideas were drawn from the data which subsequently became a substantive theory. The major categories were distilled from the narratives through use of Nvivo9 and a data triangulation process. The major categories (group of concepts that help generate theory) included environmental change, transformation, farming practices, alternative farming and livelihood. There are other various codes (key aspects that help gather appropriate information), under the concepts that are aligned and organized following the literature in the field of environment. The codes and concepts were used to develop the Causal Loop Maps (CLM) using a System Dynamics Software called Simile. The forming of CLM is also an iterative process to mimic food security and aid interventions narratives and other contextual information gathered in the process of triangulating data. Tweaking of the codes, concepts and categories was required in order to provide conceptual clarity at a glance. As there are many codes listed at the initial stage of the research they need to be distilled by separating them into endogenous and exogenous concepts. The exogenous factors need to be carefully examined because of the system dynamic search for a description of the phenomenon from within the system (the question being asked) (Sterman 2000, p. 95). The completed CLM provided the theories of the narratives via schemas. CLM is a theory

which explains the inter-linkages and shows causal relations and resolves important aspects of the issues under consideration. Finally, conceptual mapping enabled understanding and focused of the factors responsible for causal relationship and not the symptoms and events of the issues. Such a map addresses the complexity inherent in issues of interest and alert both farmers and stakeholders about improvements to farming and food production. The data analysis and outcome clearly indicated that the environmental narratives in the Nepali developmental process clearly follow international narratives developed elsewhere. This is found to have a major impact at a local level since it is promoted nationally through the national planning process. The environmental change narratives include major concepts (group of codes having a similar meaning), such as declining water resources, increased infrastructure development, a growing population, degradation of local watersheds, and climate change and local conflict. Some of the concepts drawn from the data have a local context, whereas other concepts are consumed by the communities as part of a national planning rhetoric. The outcome of this research indicates that in order to design effective policy, grounded realities need to be understood through the rural voices and lived experiences of participants and be able to link words to conceptual ideas. Being able to see linkages between concepts and feedbacks is essential to make appropriate interventions to a rural development pathway.

2311

THE APPLICATION OF A GST TO DIFFERENT SYSTEM THEORIES AND PRACTICES TO LEARN ACROSS BOUNDARIES

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A General System Theory for any Particular prospective of an observer was proposed. Here we compare and apply it to different modern system theories including Viable system model, system dynamics, cybernetics, measurement system, soft and hard systems, anticipatory systems, General Theory of Systems, system of system process, Spirituality and Systems, Health and system thinking, monetary systems.

Taichi yin-yang system theory describes the relationship between any two entities (element/process) at any level of interest. It concerns the quantitative and qualitative changes between the entities. This is compared with causal loop diagram (CLD) in system dynamics which uses reinforcing loop and balancing loop. The observer is not specified in the theories, but the perspectives of the observer actually determine the entities, the unit of quantitative changes, and the ratio of qualitative changes.

The Five systems theory of the human mind is one of the importance concepts developed in the teaching of Buddha. The Five systems are: awareness, perspective, sensation, action and physical object. These five systems are able to describe the properties of the observer and the decision maker. The observer in anticipatory systems observes the world as a realized system (physical object) through structure and function (awareness), using a contextual system (perspective). It is commonly believed that the theory in physics is totally objective and is independent of the observers, except in the field of relativity. However, it seems that the processes in the system of system process can be also arranged in the structure of the Five systems theory. For example, field process as awareness, storage process as perspective, flow process as sensation, and boundary process as action.

How hard or how soft a system is depends mainly on the flexibility of perspectives of the observer, but also on the flexibility of awareness, reaction to information, and the flexibility of actions. Viable system model cleverly separates the hard perspectives from the soft perspectives, and arranges them to the observers and decision makers at different levels. Therefore at each level of the Viable system model, flexibility of each of the five systems are fixed differently so that the daily routine work can be predicted and completed, while at the top level, the high flexibility allows the company to adapt to impacts from the environment.

The traditional Chinese medicine differential diagnosis-cure process is a practical systemic process that has been used daily for more than 2000 years. It is believed that the whole macroscopic-microscopic spectrum of systems is suitable. The system state identification involves three pairs of direction-forming spectrums. The Superficial and Internal spectrum gathers information between the boundary and the system. The Cold and Hot spectrum gathers information between the form and function, or matter and energy within the system. The Deficient and Excess spectrum gathers information between the environment and the system. Strategy can then be formulated to regulate and maintain the system. A standard accounting report can be analyzed using this diagnosis-cure process.

This GST could also be applied to understand the condition of our earth. In 2000 years ago, Traditional Chinese Medicine has already established the practice of living with the environment, rather than living against the environment. This ancient Chinese system theory on sustainability stressed on the holistic point of view between human and the environment, and said that human is part of the environment rather than the master of the environment. TCM healthcare ensure the health of human by identifying the rules of regulation to live harmoniously with the environment at different places, different influence seasons, and different situations.

Keywords: Accounting System, Anticipatory systems, Buddhism, Causal loop diagram CLD, Confucianism, Cybernetics, Five systems of human mind, General System Theory, Health and system thinking, quantitative and qualitative changes, Spirituality and Systems, System dynamics, System of system process, Taichi Yin-Yang System Theory, Taoism, Buddha's teaching, Traditional Chinese medicine differential diagnosis-cure process, Unification of nature and man, Viable system model VSM

2312

SYSTEM THEORY AND OUR MINDS – A SYSTEMIC WAY OF UNDERSTANDING OURSELVES, EACH OTHER, IN ORDER TO LEARN ACROSS THE BOUNDARIES

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The application of system theory requires the understanding of ourselves, each other, the nature, the past and future possibilities in a systemic way. That is, we need to understand both the structure and dynamics of our physical body systems, and of our mental observers. Research shows that the composition of our body and that of our mind may be explained by the same system theory relating energy, matter, life and information. We employed this simple ancient system theory as taught by Buddha to investigate how our naturally systemic-structured mind artificially developed all this non-systemic and problematic thinkings. We use our body to experience the world around us but our mind is the one who is observing and making the decisions to change the world. System theory sees the world composed of observers,decision makers, systems, the

environment, the boundaries and the relationships among them. And there are two opposite forces in the world that constantly interacting with each other, creating the flow of energy, matter and information between systems and the environment. On one hand we have the disorder force governed by the second law of thermodynamics that drive everything into a equilibrium state with maximum entropy. On the other hand we have the organizational force governed by the constrains of a system that drive the system into a particular desired steady state with a low entropy.

Our mind are both the observer and the decision maker with a major problem. Throughout our life we have been looking for satisfaction that brings happiness. Our government have been relying on economics to achieve this but 80% of the time we are dis-satisfied with the people and situations around us, bringing craving, aversion and ignorance into our minds and creating all sorts of problems in our society. This is called suffering in the teaching of Buddha, and he offered us with a three step solution for our mind. We investigate the systemic view of these three steps namely self protection, concentration and purification of our mind. We also investigate a 10 days Vipassana mental healthcare program for people of all religions including scientific communities. It is believed such a program could bring happiness, peacefulness and harmony for our community.

Death is the end of our lives or just the beginning of another new life? A system undergoes a transition of system state upon death, but will the system continue in other forms at other places? Or will it just terminate totally? What are the possible new system states and are they sustainable? We will investigate the sustainability of Heaven, Hell, Earth and Nibbana (null). And we investigate the way to prepare ourselves to transit into these states.

Keywords: Heaven and Hell, Nibbana(Null), Life and Death, happiness and harmony, purification of our mind, Vipassana mental healthcare, Buddha, organizational force, entropy, second law of thermodynamics, energy matter life and information, ourselves, Spirituality

2315

THE SYSTEMS SHAMAN: A WAY OF BEING IN THE WORLD

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From a futures perspective, Bussey (2009) offers six shamanic concepts to help make sense of our relationship to the future and how to orient ourselves to the constantly arising dynamic we find ourselves in. This poster links his shamanic concepts to systems concepts so both may be enriched. Bussey links these six concepts to Inayatullah's six pillars of futures work and six futures concepts (2008).

Bussey uses Nandy's metaphor of the shaman as someone who encapsulates the concepts discussed below. The shaman "straddles … the knowable and unknowable" and is open to "the multiple, the layered, the contradictory and the irrational". The shaman problematises the conventional outlook enabling the movement beyond the canalysed viewpoint blinding us both to the real nature of our predicament and the available alternatives.

The shaman moves away from the individual as an autonomous actor to observer of the relational dynamic including the wider context which acts as a stage revealing the unfolding drama. The context simultaneously enlivens and enables, and restricts and induces stupor. The shaman is deeply connected to the mythic realm of metaphor and story.

A systems view also prioritises the unpredictable and chaotic and shifts the emphasis from structure to process. Systems looks beyond the linear to embrace the recursive interactions at all levels of life and sees the wider picture. This requires multiple perspectives to avoid being trapped in the viewpoint of the dominant narrative.

Bussey's first concept is geophilosophy from Deleuze and Guattari (1987), which recognises that any philosophy will arise from a particular location and context. Different locations and contexts will generate different forms of valid geophilosophy. These geophilosophies rub against each other causing conflict, but also the potential for new possibilities.

The second concept, also from Deleuze and Guattari, is the metaphor of the rhizome, which is a highly connected, non-hierarchical network of roots. This interlinking engenders flexibility and adaptability. A rhizomic perspective of knowledge enables recursive feedback loops and the continual divergence and reconnecting of ideas that avoids stultification. Deleuze and Guattari talk of lines of flight as trajectories through the rhizome breaking old patterns and revealing new possibilities.

Intercivilisational dialogue is Bussey's third concept recognising the many different civilisations in our world, each with their own valid perspectives. This can free us from the deeply entrenched robotomorphism in western thought. Only through deep listening and dialogue and awareness can we expand our perspectives. Bussey is particularly attracted by Hindu and vedantic perspectives.

The fourth concept is heterotopia, which Bussey borrows from Foucault. He problematises the idea of utopia as a single perfect state, indicating the need to seek multiple perceptions as a way of moving beyond old patterns. He then moves on to Immanence.

Immanence is internal, recognising the full value of our perspective while remaining aware of what we exclude. We see the other within ourselves and encounter shadow aspects. Immanence reveals both our unique and collective possibilities that lie in potential in any context. Through autopoiesis we continually reproduce ourselves in ways that enable evolution and by structural coupling we link to others.

Finally, hybridity is where different world views and civilisational elements come together so a new hybrid reality emerges. The disturbance that is central to the shaman's way leads to a bifurcation and the emergence of a new level of complexity and agency.

Futures and systems are both highly interdisciplinary and needing to rhizomically connect to other areas of knowledge. This poster makes the case that by furthering the dialogue between the two we open doors to the emergence of new hybrid understandings that may help us move together into the future.

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MEMORIALS FOR DECEASED PAST PRESIDENTS OF THE ISSS

58th Annual Int'l ISSS Conference, Washington, D.C. July 27-August 1, 2014

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This is a two poster series. The first poster commemorates the contributions to general systems theory and to conventional disciplines of Stafford Beer, Heinz von Foerster, Ilya Prigogine, Howard Odum, James Miller, Bela Banathy, C. West Churchman and Yong Pil Rhee. This group includes a Nobel Laureate, a Craford Prize Winner (the alternate

Nobel for ecology), the “fifth” Founder of general systems theory, and Founders of important new fields such as Operations Research and parallel computing. The poster was stimulated by the unprecedented loss of eight past ISSS President in just the two-year period from 2002 to 2004. In each case there is an attempt to include some observations about the personal traits of these leaders as well as their many creative contributions to scholarship and society. The second poster continues with ISSS President’s who passed away in later millennial years, including Anatol Rapoport, Russell Ackoff, John Dillon, G.A. Swanson, Robert Rosen and John Warfield. Again this august group includes one of the original Founders of the Society for General Systems Research (before it was renamed International Society for the Systems Sciences), another Founder of Operations Research, a proponent of Mathematical Biology and a Founder of Systems Engineering. These outstanding individuals were Presidents of other professional societies beyond ISSS showing their achievements in many disciplines beyond systems thinking. These posters comprise one of several memorials to those who have served this society and more importantly all of society in pioneering a worldview and approach so necessary to the future of humanity and civilization.

Keywords: ISSS, past Presidents, contributions to general systems theory

2384

PROPOSAL FOR A CURRENCY WITH DIMINISHING VALUE: THE KEY TO CHANGING THE SYSTEM OF VALUES

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A new form of digital, government-controlled currency, with pre-programmed diminishing value is proposed to address current intractable fiscal challenges globally. The present global crisis spiraling the world’s market into recession is as a result of those intractable fiscal challenges revolving around current world currency, Money. Money in its current form is firmly established as the sole medium of exchange to the degree that it’s considered absurd to come up with an alternative. Before inventing money, trade by barter was the norm to obtain needed goods and services. This did not provide the transferability and divisibility required in trading. This led to the invention of commodity money such as the one backed by gold. What we have today is called fiat money. It dispenses with the need to represent a physical commodity. This Money is guaranteed by means of people's perception and faith. Money has evolved far beyond the reasons for its invention: stock markets and derivatives create money based on speculation. Banks print money, although ordinary people often appear oblivious of this. Even worse is the fact that money reproduces itself: without any work done, money increases by simply printing more or depositing it in a bank and collecting interest! The end product is powerful support of a status quo in current world values, which unfortunately perpetuate complex societal problems. The authors propose a simple, yet revolutionary approach on how to transform this established global fiscal values with systemic, far-reaching consequences: Currency with a diminishing value. It’s diminishing value over a set time period will protect against the turbulences of global financial system and the profit-focused harsh world of global finance. It will not only satisfy basic needs of economic transactions, but it will contribute, among many other things, towards higher market liquidity and decreased deposits that create wealth.

Session Abstracts

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TOWARD THE STRUCTURING OF MEANINGS OF THE MEXICAN DAY OF THE DEATH RITUAL, UNDER A COMPLEX SYSTEMS APPROACH

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The objective of ethnographic work has among its objectives to describe human behaviour in society and the ways in which social institutions is structured. Therefore, describing the inverse processes is a fundamental part of ethnography, i.e. the effects of social institutions on the human behaviour and the consequences of social behaviour could change or remain in social institutions. The mathematical modelling of changes and continuities in social institutions is one of the issues for the hard sciences and social sciences subjects. In this paper we present to the reader a proposal to formalize the structure of a Mexican social phenomenon called “Ritual”.

The Ritual of Deaths in Central and Southern Mexico has certain qualities that have been passed from generation to generation through Sign Systems under rules and patterns of communication-restricted interaction, these systems are called social institutions, they will be understood from the Systemic Science comparable to regular lattices and complex network. Such as the interaction of human groups in shared social spaces like public squares and cemeteries realize connectivity between individuals in the form of long-range connections or random long-range connections.

The combined use of two types of networks (local and random) to model Complex Systems of Human Activity is called small world networks. Essentially the topological connection from a logic of classes can be supplemented regularly where the probability (p) is p = 0, or completely random where p = 1. However, the threshold of interest for social topological space networks is intermediate between 0 and 1: 0> p> 1. With the understanding that this is an exploratory methodology, the derived power law probability distribution of signs between nodes allowed to sight a percolation threshold.

Through Ashby’s Law of requisite variety, describes the qualitative properties that governing the internal structure of the network, and the description of network changes, in this case the critical site, show how the network links to the percolation threshold. The objective to observe this critical site under the Law of requisite variety is to test whether the postulate of Ashby can be applied to conscious systems, i.e., testing whether the relationship that serves as the regulator (power law) acts to limit the outcome to a particular subset, or to maintain some variables within certain limits, or even to hold some variables constant.

Finally, this article will help to understand how the cultural and spiritual heritage is transmitted through time.

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TOWARDS A COMPLEX SYSTEMS APPROACH IN CHARACTERIZING VOLATILITY DURING FINANCIAL MARKETS CRISIS.

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Recurrent financial crisis have been a constant threat to economic stability, arguably since the first recorded one dating from 1636-37 in Amsterdam (tulip mania). The difficulty in predicting or forecasting shocks or crisis makes a new approach imperative. There exists a clear incentive to develop a model, system or mechanism to better understand the nature of crisis in an effort to mitigate the deleterious effects they have on the real economy and innocent participants; pensioners, vulnerable social groups or emerging nations.

Since late 1980s, a new pattern in the modeling of the markets has been emerging. Detached from a rigid and dehumanized methodology based on classical assumptions of rationality of economic agents, markets efficiency, independent randomness of price change, tendency to equilibrium and normal distribution of returns, the new models are not contesting anymore a description which includes bounded rationality, nonlinear responses, diverse degrees of long term dependence, information inefficiency, non-equilibrium and fat-tailed non Gaussian distribution. From this new perspective, a better way of describing behavior in the financial markets is advanced.

We may identify these characteristics as emerging properties generated by the nonlinear interaction of many dispersed units acting in parallel and without global or central control. Control mechanisms are rather provided by competition and collaboration between units mediated by operating procedures, assigned roles and shifting associations.

Any given unit action depends upon the state and actions of a limited number of other units with many levels of organization. Unit interaction is more than hierarchical, with tangling and continually revised connections across levels, looking for adaptation to new conditions and new niches that can be exploited.

We support that nonlinear dynamical system of self-reinforcing or autocatalytic type with local positive feedbacks offer a better explanation to the emergent properties observed in financial markets prices, such as upside and downside trends, price formations, support and resistant levels, bubbles and cracks. Models based on empirical evidence that can yield testable, even if primitive, predictions by means of computer simulations are of utmost necessity.

Using quantitative tools from physical statistics, we propose to characterize price fluctuations in the markets during financial crisis as an emerging property through dynamic scaling of those fluctuations, in order to establish the bases to construct more accurate models for forecasting returns.

Consequently, we propose to carry out a nonlinear fractal analysis of financial markets' time series in order to identify emerging properties that govern market dynamics. We believe that the findings may allow us to construct more accurate models in order to better predict the effect of volatility in markets during financial stress or crisis.

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GENERAL SYSTEMS THEORY THROUGH LINGUISTIC MODELLING

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The term ‘system’ has been used sporadically over the past like the ‘Ptolemaic or Copernican views of the solar system’, ‘systems of rigid bodies’ or a ‘system of differential equations’ by men of science and by people in the course of their lives like ‘road system’, ‘communication system’ and so on. This usage usually occurs when an object or activity is perceived as complex and needed to be referred to in some, usually, vague manner. The term came into wider use with the development of servomechanisms, or control systems during the 2nd WW for directing antiaircraft guns, for example, followed by the huge expansion of control theory. Concurrently and later topics like ‘operational research’, ‘cybernetics’, ‘systems dynamics’, ‘viable systems’, ‘living systems theory’ etc emerged. Strands of thinking like ‘interpretive, emancipatory, critical approaches’, ‘chaos theory’, ’complexity science’, ‘reflexivity’ and so on have opened up. Thinkers like von Bertalanffy and Boulding realized the general applicability of the term ‘system’ or the ‘systemic view’ for describing states and events which appeared complex resulting in ideas like ‘general systems theory’ as some kind of a super theory.

Developments aimed at a general systems theory were made based on the idea of existence of homologies between disciplines that have traditionally been considered as being separated by their different subject matters. Mathematics is the favoured symbolism by which this idea is expressed. General systems theory is considered as some kind of meta theory. Lately attempts along this line were abandoned. As an alternative, evolution of a wide range of topics under ‘systems thinking or systemic view’ has been going on along highly speculative lines interspaced by methods of modelling and attempts at systems design most with ill defined, vague concepts which were difficult to apply to problematic scenarios. A vast number of publications has appeared, conferences and courses at university but not at school level have been held. Control theory has been widely recognised as a separate discipline and had always been a problematic issue in engineering education. The essentially universally applicable systemic view has become fragmented into information systems, social systems, soft/hard systems, service systems, control and computer systems and so on, and the trend continues.

In addition, there is a variety of ‘systems tools (such as influence diagrams)’, ‘techniques (black box technique, Petri nets, UML and so on)’ and ‘methodologies (soft system methodology)]’ without appropriate theoretical basis. Their appearance and development may be due to a ‘feeling’ that there are vaguely defined ‘related objects’ acting as the subject matter of the ‘systemic view’ in technology, society and in living and non living nature.

The practice of the ‘systemic or structural view’ of parts of the world is an empirical exercise at the same level as ‘viewing things through their qualitative/quantitative properties’ which engendered the development of conventional science. Speculative discourse is suitable for generating ideas, expressing trends etc but an empirical exercise requires a reasoning scheme expressed in concrete terms so that its conclusions can be exposed to the test of experience. Development of systems science along this idea from the ‘structural view’ is based on the assertion that this view is : A. Pervasive, B. Indivisible and C. Empirical.

The development is then justified as a candidate for GST with linguistic modelling to provide the symbolism of ordered pairs and predicate logic sequences describing static and dynamic structures carrying qualitative as well as quantitative qualifiers. The method

is applicable to scenarios with technical, living, human and natural constituents and can be exposed to at least thought experiment. The structure of the method of linguistic modelling is given in Fig.1. which shows the sequence of preparation of the same kind of model for any application, a feature of GST.

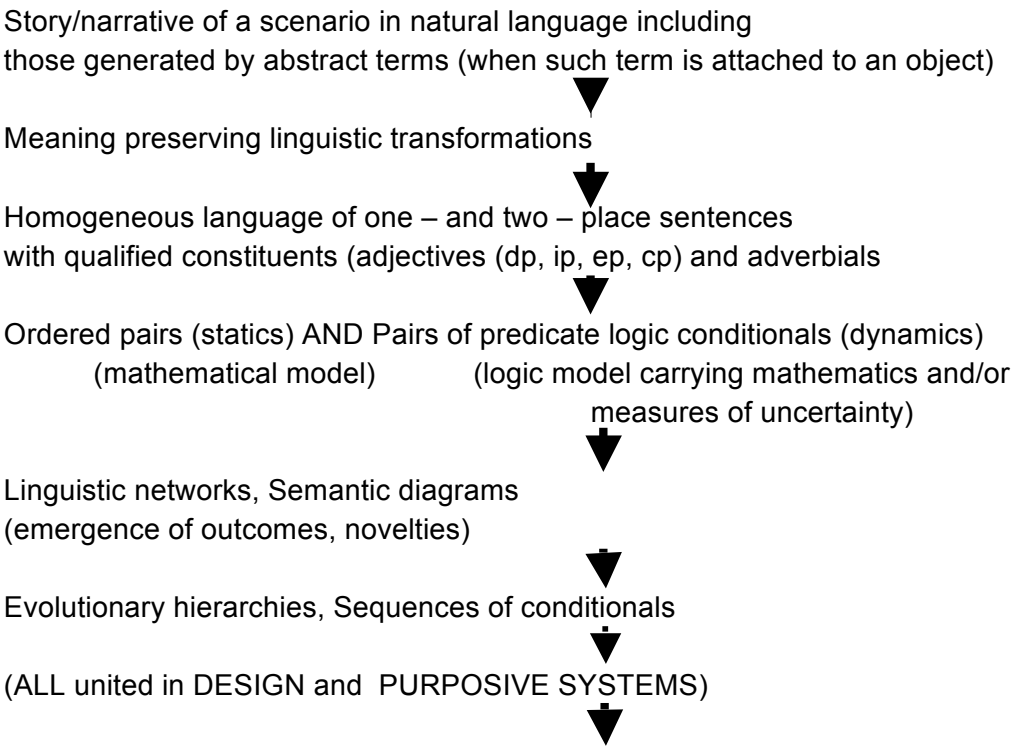

Fig.1. Structure of linguistic modelling

The suggested approach provides a unifying basis for the 'systemic view' and may serve as a 'systems discipline', it is based on accepted branches of knowledge of linguistics, logic, mathematics, computing etc, eminently teachable and is an essential part of problem solving inclusive of design. Problem solving, the most fundamental activity of all living things, may facilitate the spread of 'systems thinking' in society, education and professions.

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STUDY FROM TAOBAO.COM（CHINA）

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Adverse selection refers to a market process in which undesired results occur when buyers and sellers have asymmetric information; the bad products or services are more likely to be selected by consumers. Compared to the traditional market, the e-commerce transaction still could not get rid of the adverse selection problems, which seriously affect network online consumer buying behavior and reduce the efficiency of the online transaction. Now in China some trading platforms such as Taobao.com（China）are seeking some counteracting mechanisms to reduce adverse selection problems. Widely used mechanisms are credit scoring mechanism and guarantee mechanism. This paper

takes transaction data from U disk market in Taobao.com as samples and analyzes the role of credit scoring mechanism and guarantee mechanism in Chinese e-commerce market. The results showed that the credit scoring mechanism and guarantee mechanism can effectively offset the negative impact from the adverse selection problems. Although the credit scoring mechanism has a significant impact on transaction volume; guarantee mechanism has greater impact on the trading volume than the credit scoring mechanisms. In addition, relationship between the guarantee mechanism and credit scoring mechanism are not substitutes but complement for each other. In the case of the existence of the guarantee mechanism, online consumers' purchase for online goods options is still subject to the impact of the credit scoring mechanism. The paper proposes strategy recommendations to improve credit scoring mechanism and guarantee mechanisms to promote the efficiency of online transactions.

Keywords: adverse selection; credit scoring mechanism; guarantee mechanism

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KNOWLEDGE SHARING AND PROFESSIONAL ONLINE COMMUNITIES ACCEPTANCE IN EGYPT: AN INTEGRATED MODEL

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Recently, organisational researchers have accepted knowledge to be one of an organisation's richest resources, and supporters of the resource-based view of organisations believe that knowledge is a strategic key resource that definitely leads to competitive advantage, better work performance, effectiveness and innovation. However, most organisations might not have all the required knowledge in their possession within their organisational boundaries. Moreover, organisational members may incline to hoard and not willing to provide valuable knowledge due to the fear of losing superiority or power obtained from the ownership of that knowledge. Competing for the same resources might be another major obstacle to sharing knowledge between organisational members. Ideas, new information, and experiences, which are required for dealing with a wide range of problems, can be obtained freely by the organisation's members and individuals through external network connections. One of the available options to make such connection to external sources of knowledge, especially at the individual level, is by participating and being involved in knowledge communities.

Professional online communities (POCs), which have been defined as online networks in which individuals with common interests, goals or practices interact to share information and knowledge, and engage in social interactions, have been used widely by many different professions for knowledge sharing. Now professionals can share their ideas and experiences, find quick answers, gave access to other individuals with the same interests, solve job related problems, and perform complicated tasks through productive collaboration and interaction with both known and unknown colleagues. Although the importance of the use of POCs for knowledge sharing is widely acknowledged, very little is known about (a) what factors provide the main contribution in explaining professional use and acceptance of POCs; (b) what mediating mechanism is involved; (c) whether the proposed factors have differing or similar implications for POCs use behaviour and (d) whether members' perception of these factors differ when they use POCs for knowledge acquisition compared to knowledge provision.

Thus, drawn upon theoretical foundations, empirical studies and contextually relevant research, this study tries to integrate and validate some key variables (system/knowledge self-efficacy, relational capital, and community system

characteristics) with the unified theory of acceptance and use of technology (UTAUT) to develop a comprehensive model that have the ability to capture the factors that can motivate professionals to use POCs for knowledge acquisition and for knowledge provision. To achieve the research aims, an integrated model was developed and tested through a survey administrated to 376 members of eight professional unions in Egypt. Structural equation modelling (SEM) was used to validate and to examine the research model.

The findings showed that the use of POCs was explained by a rich set of variables that were derived from well-established theories. This study adds to knowledge by demonstrating that the community's system characteristics and members' belief in their abilities to use the community system facilitate the transformation of POC resources to performance and personal benefits and, consequently, encourage members to use the community for sharing their knowledge. Interestingly, the results showed that the community system characteristics differ significantly in their influences on performance/personal outcome and effort expectancies according to the kind of usage. Additionally, the findings revealed that members who perceived high content and community's system quality were more likely to show a higher degree of relational capital (trust). Other important findings and implications are presented and discussed in more detail.

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A SYSTEMS APPROACH TO BUSINESS PROCESS EVOLUTION

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The "First World" has become an information society, increasing the complexity of management in a business environment which is characterised by complexity, simultaneity, asynchronicity and de-centralisation. In this world, information systems are no longer simply an adjunct to business, but are at its heart; automating, informating, virtualizing and transforming organisations and work, social groups and human interaction. In this environment one might expect that business managers would readily see the value of, and hence adopt, the use of systems methods. However, managers have largely ignored the systems sciences, preferring instead to adopt a series of seemingly endless management "fads," including Business Process Re-engineering (BPR) and Total Quality Management (TQM). These "fads" are more attractive to practising managers than systems methodologies because they are more easily "sold" as supportive of the pragmatic mind-set. Management take-up of "fads" stems largely from the fact that; "What men really want is not knowledge but certainty".

However, human activity systems are complex, self-regulating and adaptive, and so too must be the systems by which change is planned and managed. Self-generated and self-organised evolutionary change processes can enable systems to adapt, evolve and improve as circumstances, perceptions and requirements change. For successful business process evolution (BPE), the consideration of change and its effects must frequently be analysed and interpreted at more than a single level and in more than a single dimension, often in many (interleaved) cycles of exploration, understanding and change.

Developing a shared appreciation among a coalition of organisational stakeholders of "the best way forward" generally fosters and enables improvement in complex

organisational systems. Such a shared appreciation can benefit from a framework that promotes and supports teamwork, synergy, mutual understanding and conflict resolution, in order to support a fusion of horizons.

Organisational effectiveness is difficult to define, often unknown and generally a moving target. BPE, therefore, must be underpinned by the recognition that there may be many different, and equally valid, views of what might constitute "organisational improvement" and how such "improvement" might be sought. In order to achieve an agreement over desirable, feasible and beneficial change, BPE must somehow address this complex set of pluralist positions. It must also seek incremental improvement through learning, negotiation and compromise while recognising the importance of IT, IS and IM as integral parts of the broader business system. In the Information Economy, BPE must also support a variety of technologies, tools, techniques and approaches from the domains of Business Analysis and Information Systems, to support exploration, understanding and change, using principles of method from both the hard and the soft paradigms.

This paper sets out an evolutionary approach to organisational change; especially change involving information systems.

The approach described is founded upon the collaboration of people involved in the area of concern; a process of critical enquiry; a focus on social practice; and a deliberate process of reflective learning. The approach is systemic in nature, systematic in its coverage and pragmatic in its application, allowing a balance to be struck between creativity and control. Focusing on enabling systems, rather than on methodical phases, it views organisational change as systems based, rather than project based and recognises that change must necessarily be planned for and managed, but should be systemic rather than formulaic.

2154

SYSTEMIC DESIGN OF A SLIDING MODE BASED MODEL FOR ANALYZING THE PERFORMANCE OF AN ACOUSTIC SENSOR.

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Currently it is common to use sensors in all aspects of daily life. So, in geophysical processes electronic sensors are required to measure and automate different tasks such as characterization of deep wells, basins, lakes and caves among others. Acoustic sensors are famous because its foundation is mechanical detection, or a sound wave. The acoustic signals are able to be reflected in places which other signals cannot operate either drawbacks or where the liquid moves.

This research aims to develop a systemic mathematical model, representative of the acoustic waves used in acoustic sensors, for analyzing the response to deterministic and non-deterministic variables, also, that assists in the analysis of the damages that have with environmental disturbances, problems which is currently being studied in the worldwide, in order to expand the potential of using acoustic sensors in the global scope.

To achieve the objectives of this research, a systemic and systematic approach methodology is followed, using techniques based on sliders modes to design state feedback control, allowing robustness in the system. Likewise, application results are discussed in the model for optimization. The application of theories and methods, with a

systemic and systematic approach enables other form of analysis, interpretation and solve systems problems.

Keywords: acoustic sensors, mathematical model, sliding mode.

2155

ANALYSIS OF HURST EXPONENT AND THE FRACTAL DIMENSION OF SEISMIC ACTIVITY OCCURRED IN THE COCOS PLATE, MEXICO.

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Earthquakes are a natural phenomenon of great interest, know and understand the processes and mechanisms that the generated is subject of research worldwide, and it is essential to develop models that allow in the future understanding their behaviour and therefore predict their occurrence.

The objective of this research is to analyze the dynamics of seismic activity occurred in the Cocos Plate - Mexico, through the evolution of the Hurst exponent and fractal dimension in 3D, in time series of seismic activity, taking the magnitude (M) as the main parameter.

In the analysis is used the methodology for the development of earthquake prediction models developed under the systems approach designed by the authors. To define the time series of seismic activity, are considered first annual intervals to find the Hurst exponent of each year since 1988 (the year in which the database is consistent) until 2012, and then it accumulates the years to find again the Hurst exponent to see the cumulative evolution of it.

In research, is analyzed the seismic activity occurred in the Cocos Plate in Mexico, in the period from January 1, 1988 to December 31, 2012. Analyses were performed following the methods proposed in this research, mainly considering that the Hurst exponent analysis provides the ability to find that the space-temporal behaviour of the seismicity obey and/or can be described by parameters such as the dimension fractal and complex systems.

Keywords: Hurst coefficient, fractal, seismic activity, time series, earthquakes, earthquake prediction.

2156

DYNAMIC ANALYSIS OF SUPPLY AND DEMAND FOR ELEMENTARY SCHOOL ENGLISH TEACHERS IN TAIWAN

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Elementary school is the place where the fundamental knowledge of the people created and passed on. The long-term stability and balanced development of human resources in teaching is of vital importance to the quality of foundational education and to its efficiency in being implemented. If it is not planned and controlled well, this may cause directly impacting on Taiwan's competitive strength in the future, such as teacher supply and demand imbalance, and wasting human resources. The supply and demand of elementary school teachers in Taiwan is a complicated and dynamic issue, influenced by teacher education policies, birth rates, government financial strength, and educational reform. This paper first analyzes the development course of elementary school and teacher education policies in Taiwan, along with the birth rate and the excess supply of elementary school teachers. The methodology of system dynamics is used, taking a holistic view to investigate the system architecture of elementary school English teaching in Taiwan. A dynamic model is constructed to explain behavioral phenomena within this architecture, increasing the understanding of the dynamic trends in the supply and demand of elementary school English teachers in Taiwan. Using the dynamic model and simulating educational policy to understand its potential results, an analysis of policy impact is presented along with coping strategies. We hope that this research will be beneficial to the development of elementary school education in Taiwan.
Keywords: System dynamics, teacher supply and demand, elementary school, policy effects, dynamic model

2158

HYBRID METHODOLOGY FOR THE DIAGNOSIS OF A TUMOR PROSTHESIS KNEE

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In medical practice, it is common to find complex biological and engineering systems, these systems have multiple interactions with the environment and within themselves.

Systems engineering can study and understand the reality, in order to implement or optimize complex systems and transdisciplinary view may integrates several disciplines into an effort team.

The concepts and methodologies of General Systems Theory may help to medicine, to integrate social, psychological, economic, historical and anatomic factors causing a medical condition, if all factors are considering, it is possible to provide a complete treatment. The prosthetic systems used for the treatment of bone tumors are one example of complex system. The systemic view helps to identify the factors that cause unexpected behavior of the prosthesis, its subsystems changes and patient interaction with the prosthesis in daily life.

Bone tumors adversely affect the health and physical integrity of the patients who suffer them, in severe cases, threaten the life of the patient. The anatomical region most often

affected is the knee (over 50%). One of the treatments listed in this condition is surgical removal of the tumor followed by reconstruction site affected by arthrodesis.

Patients with arthrodesis can perform some demanding activities from the physical point of view (walking in uneven or slippery surfaces, up and down slopes, picking things up standing). However, they have limitations as to the function of the affected limb. Arthrodesis has the advantage of involving a lower cost and to preserve the patient's anatomy, which is a better option from the emotional point of view.

The National Rehabilitation Institute (INR) is one of the National Institutes of Health of the Mexican Federal Government. The INR has its own design of spacer and intramedullary nail for knee arthrodesis. The implant consists of a solid intramedullary nail of Ti-6Al-4V medical grade alloy, which is inserted through the medullary canal of the femur and tibia, two pin blockers for the femur and two pins for the tibia, and a cylindrical spacer standing on the site of the knee.

Although the implant has been successful many times, the life of the implant is limited by pins loosening, which causes intense pain to the patients, negatively affecting their quality of life. This is because the loads on the pins are very high, so sink into the bone beneath them. Using Finite Element Analysis has shown that the location of the pins over the resection site plays an important role in the way the loads are distributed throughout the implant and the size of the resection influences the loads occurring in the pins.

To achieve a comprehensive diagnosis of the prosthetic system various departments of INR should work together: Bone Tumor Service, Biomechanics Laboratory and Quality of Life Department.

To integrate the worldview of these areas a hybrid methodology (soft and hard systems) are implemented by developing a design of experiments that involves a larger number of variables than the analyzes described above, and the methodology of Checkland and Cybernetics Model in order to evaluate the performance of the prosthesis and how does it impact the quality of life of patients.

2159

ENHANCING LEAN INTERVENTIONS THROUGH THE USE OF SYSTEMS THINKING IN THE FOOD PRODUCTION INDUSTRY: A CASE IN THE NIGER DELTA REGION

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This paper discusses how Lean Thinking (Lean) interventions can be enhanced through the use of Systems Thinking (ST) tools and methodologies. Lean has emerged as a process improvement philosophy aiming to identify and eradicate waste via the usage of various tools. However, Lean tends to focus narrow stakeholder input, their views and their agendas, leaving out the impact of the operational process on the other relevant stakeholders that may be affected by the system. Such a narrow view has an impact on both the implementation and adoption of Lean, as well as its success in improving organisational processes and in sustaining changes.

To address this gap, a proposal for the use of Systems tools. Such approaches have long recognised the influence of the various stakeholders to the implementation process. ST tools therefore seek to take Lean beyond the limits of identification and waste elimination to include an all-round effort that seeks to meet the expectations of both the organisation and its stakeholders. This would emerge as an approach with the intention to pursue success from different perspectives, via a fair participatory approach. A ‘Lean and ST’ approach would therefore encourage a practical reflection on the identified

complexities by those involved and jointly develop an approach to address them and improve their processes.

Enhancing Lean with ST is particularly important not only for the developed, but also for the developing economies, such as the Niger Delta region, where this research is based. However, Lean interventions have been unpopular in the Nigerian context largely due to the practice and belief among operations managers on the use of traditional management approach/es which tend to place emphasis on resource efficiency, despite the need for more effective approaches to process improvement.

To address the aforementioned gaps, the research questions of the study are: How could Lean and ST tools be applied in improving processes and related issues in the Niger Delta region of Nigeria? How can the practice of Lean as a process improvement tool be enhanced with the use of Systems approaches to address the issues identified? What are the challenges associated with this use?

The research applies 'Systemic Intervention' as the research methodology and adopts action research, using a commercial livestock farm in the food production industry, in the Niger Delta region of Nigeria. Systemic Intervention allows the combination of different ST methods and methodologies to identify and address operational challenges associated with the use of Lean and Systems tools. The research was carried out in four phases spanning a nine month period. Data was collected through identifying and interviewing appropriate stakeholders (members of the case study firm, grouping of the stakeholders), carrying out Lean interventions (e.g. Value Stream Mapping), and using ST tools (including boundary critique, CATWOE, and Rich pictures), and participant observation methods. Data were transcribed, manually coded, and analysed inductively.

Through the findings a proposal for an alternative approach to conducting Lean interventions based on ST, and discussed the advantages for carrying out these interventions and bringing Lean changes. It suggest, then, that ST tools would effectively support the implementation of Lean in enhancing a wider acceptance among the concerned stakeholders and engendering a systemic solution to identified challenges, considering the interest of and impact on the different stakeholders. Furthermore, it pointed out the main constraints that may impair effective implementation and adoption of Lean and ST including, the autocratic leadership style and boundary rigidities in the operational structure, which hinder effective team play among organisation members. Finally, it is highlighted that this approach would require time to be adopted and used in the particular context.

2161

SYSTEMIC PARAMETER ESTIMATION FOR THE DIAGNOSIS AND TREATMENT OF DEVELOPMENTAL DYSPLASIA OF THE HIP IN CHILDREN

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The human being is a complex entity as such has a set of features that makes it different compared to other living beings. The bio -psycho- social conception of the human being is part of systems thinking: a totality organized by a number of interrelated and interdependent entities.

From its origins science has tried to explain reality and seek control of those natural and transcendental phenomena that take place in it: the life, illness and death.

Disease and / or medical conditions affecting the health of people for settlement have developed models, techniques and tools to use the response time decreases. These have evolved into a transition aimed not only significantly prolong the years of life and survival of a patient, but also the well-being or quality of life related to health, which refers to the consequences of disease or treatment on physical , emotional and social wellbeing of a person. The change in the health model allows reviewing the definition of health and health care.

Practically, this model argues that health systems should consider this continuum of biological, psychological and social factors at diagnosis and establishment of treatment which will help to effectively manage the process of health and illness in a person, covering the evolution, the course of illness and recovery and/or rehabilitation of the individual.

As medicine has evolved, have been discovered diseases that affect the health of people and produce both partial and total in these conditions, preventing the development of skills and attitudes within society.

Within the range of diseases and/or conditions are those that damage the lower or hind limb of the human body (hip).

One of these conditions is Developmental Dysplasia of the Hip (DDH) in children, which is presented as a condition of uncertain origin, evolution insidious and discouraging treatment if your diagnosis is not made early. The surgical procedure is often very invasive for the patient, since the bone composition is not fully formed and can cause secondary conditions that diminish their ability to lead a normal adult life.

From a mono-disciplinary approach may provide a solution to this problem, but not entirely. With the implementation of Systemic Methodologies and Tools we address this problem holistically, because with this implementation, we can obtain the factors affecting our study and thus provide a solution to diminish entirely side effects.

It is for this that comes a Systemic Methodology which consists of Soft and Hard Methodologies as an option for the study of Developmental Dysplasia of the Hip (DDH) in children in order to estimate parameters to identify the factors affecting the development of this condition at the time of diagnosis and treatment, in order to make improvements in applied surgical procedures and develop options to decision- making by the specialist to reduce risks that may arise and provide quality of life for patients in their family and social environment.

Keywords: Assessment, Diagnosis, Settings, Systemic.

2162

SYSTEM DUALITY: BIRATIONAL HIERARCHY

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System theory, and most particularly hierarchy theory, must be consistent with philosophy. In his book “Logic in Reality”, Brenner reinforces the traditional philosophic position that an entity can only exist in relation to its non-existence. This leads to a duality in system theory which is consistent with the selective division of Nature into entity and ecosystem, where the two depend on different criteria and even different logics. A fascinating aspect of such a birational approach is that representations and properties only exist as intermediates between pairs of ideal extremes. Quantum logic,

for example, no longer replaces post-Newtonian classical logic; it complements it, identifying all real entities as compromises between the two. This albeit philosophically non-traditional included middle is identical to that of the philosophical logic of Stéphane Lupasco, and to the implications of Brenner's "Logic in Reality". This presages a major philosophical change in the way Science can be carried out. What we wish to do is to bring all of Science under a generalized umbrella of entity and ecosystem, and then characterize different types of entity by their more or less important relationships with their relevant ecosystems. The most general way to do this is to move the ecosystemic paradigm up to the level of its encompassing logic, creating a complementary pair of conceivably different logics – one for the entity we are focusing on; one for the ecosystem within which it exists – and providing for their quasi-autonomous birational interaction. We present a representation of natural hierarchy which is itself dual in character, and counsel that monorational constructions are ineffective. As an example, we present a dual formulation of entropy.

2166

USING BOUNDARY GAMES FOR ANALYSING ACTOR´S INTERACTIONS

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When standard codification techniques are applied to the problem of analyzing actor's interactions, the sense and direction of the conversation are lost. As a way to deal with this problem, the paper proposes the use of the Boundary Games method (Velez-Castiblanco) for the analysis of interactions. This method allows the description of actors' actions in terms of the effects of their communicative expressions over the boundary encompassing the assumptions considered relevant in the discussion.

This method draws from Boundary Critique Theory, and Language Pragmatics. Specifically, Boundary Games are underpinned on Midgley and Ulrich Boundary Critique, Wittgenstein's language games and Sperber and Wilson Relevance Theory. It is argued that this method allows us to identify interaction patterns, actor´s intervention approaches, point of views fueling the debate and the pivot proposals mediating among these views. All these let us represent sequences of events or trajectories of the interactions.

The data analyzed comes from observations of a top management team responsible for the corporate strategy of a Colombian multi business firm. The main purpose of this research is to understand the way that managerial knowledge deploys in the management of the business portfolio. These data was first analyzed under the grounded theory codification process in order to describe the parts of the system under study. These data, then feeds boundary games interactions analysis.

2169

PROJECT MANAGEMENT AS DISCOVERY

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Complex project or program is inherently uncertain, ambiguous and high risk even if its end goal is clear. For example, the contemporary Australian National Broadband Network program's goal is clear – to provide high speed broadband access to all Australians. Yet, the program is suffering numerous delays due to setbacks caused by uncontrollable, and sometimes unforeseen, endogenous and exogenous contingent variable factors such as technology uncertainty, uneven contractors competences,

government policy change, or unexpected poor state of disrepair of incumbent fixed-network infrastructure (through which the broadband network will be laid) which collectively interact with one another in unpredictable manners. There is scarcity of knowledge as to how complex projects could be managed successfully.

This paper proposes a new conceptual model for managing complex projects. In particular, we argue that the traditional "iron triangle" (functionality, time and dollar) measures of project management success are ineffective, and arguably counter-productive, for complex programs. This is because of complex programs' inherent structural (often of organic rather than mechanistic nature) complexity and outcome uncertainty. Instead, we argue complex programs could be more effectively modelled and managed as social systems, with multiple stakeholders (often with conflicting interests), which should be managed through a discovery (and dynamic) process via the lens of stakeholder (including customer) value creation, specifically the principle of value co-creation.

Complex project is a social system because a project is generally co-owned1 and (whose goal is) socially co-shaped (via negotiations) directly and indirectly by a community of stakeholders (both internal and external of the project organization, with each stakeholder having varying degrees of agency power and influence depending on their degree of constitutive project-relevant legitimacy and knowledge capability). We anticipate stakeholder theory, structurisation theory and service science (especially value co-creation) theory are likely candidate theories suitable for conceptual integration with traditional project management methods to define a new (theory-informed) effective mechanism or practical method for successful (measured by optimal value creation by) complex project management. According to structurisation theory, the structure (rules, governance etc.) of the social system (comprising the constitutive stakeholders and their interrelationship) and the day-to-day practice of project management (problem solving or issue resolution to create 'project' value) are mutually constitutive. This means the project manager must be ambidextrous and highly sensitive to and skilful in managing and 'co-creating' stakeholders' evolving 'value' expectations to guide the project along the "edge of chaos" (simultaneously stable in terms best-practice project management discipline and yet flexible enough to accommodate variety or diversity due to conflicting stakeholders' emergent requirements) towards the ultimate project success – vision attained with the attendant optimal value co-created.

It is a discovery process because project value is contextual (in the eye of the beholder), emergent and temporal (or transient) due to the bounded rationality of the stakeholders whose requirements for, expectations from, and understanding of the project are transitionary from weak, initially, to increasingly stronger as project knowledge is being accumulated via learning from project execution. It is also a discovery process because project management is about (a) discovering, at any point in the project's journey, and making sense of and explicating from, the emergent non-linear interactions amongst the complex project's various endogenous systems (including stakeholders) and exogenous environmental variables (such as disruptive technological innovations, regulatory policy change or natural disasters) what new value creating opportunities (e.g. even potential project disruptions could be treated as opportunities for exploring and developing new project skills in expeditious handling of and rapid recovery from complex, unforeseen and unknowable, project exceptions) might present that would contribute toward the overall end-goal of the program; (b) seizing and acting on the emerging opportunity; and (c) shaping and reshaping the project resource configuration to co-create the emergent

[1] Even in the case when a project usually has a single business owner with the budgetary discretionary power.

value and realise the opportunity as a stepping stone towards the end-goal of the project. Here, we envision the dynamic capabilities theory from strategic management discipline, together with the abovementioned management theories, could be adapted and integrated with traditional project management methods to finally create the paper's principal new conceptual contribution: a new theory-informed method for successful complex project management – one which shifts the locus of project management success from the traditional "iron triangle" metrics (supply-side) to value co-creation metrics (demand-side) which satisfy the evolving disparate requirements and expectations of all stakeholders through the project manager's holistic skills in governing and managing the complex social system.

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USING ACTION RESEARCH TO IMPLEMENT AN ORAL DISCOURSE APPROACH FOR TEACHING ENGLISH COMPOSITION WRITING

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English Composition writing requires thinking as one writes and it demands that a pupil uses written sentences to connect ideas to present a composition story in a coherent manner. Yet, English composition writing remains a challenge for many pupils and they do not enjoy it. This research study responds to this challenge by doing four things. Firstly, it gets to the core of what a composition writing lesson should be like, by adopting an "Oral Discourse Approach" as described by Golub (1970) and Wyans (2008), to help pupils generate ideas and supply reasons to ensure that each idea flows logically. The compilation of written ideas gathered from the entire class would then enable each pupil to construct his or her composition in a coherent manner. Second, it expands the work of Golub (1970) and Wyans (2008) by incorporating the use of a "Plot Graph" to help pupils order and organize their ideas. The application of "arrows and numbered boxes" in a Plot Graph helps pupils visualize the flow of ideas in the form of an organized arrangement of written ideas that are logical, thereby showing how the composition story is developed in a step by step manner from start to end. Besides, the plot graph also empowers the rhetorical thought processes of each pupil by enabling pupils to trace how a sequence of events leads to the climax and how the resolution solves the problem. Third, it uses the Dialectic Soft Systems Methodology described by Dick (2002) and Tay and Lim (2004 & 2007) to explain how the process of composition writing can be described as progressing through four dialectics. The Dialectic Soft Systems Methodology is not a new form of Checkland's Soft Systems Methodology. It goes through the same process as the "7-stage" description, except it is presented from a different perspective. Through the Dialectic Soft Systems Methodology, the classroom-based Oral Discourse Approach can be turned into an individualised approach which a pupil can internalise and apply during examination or personal practice at home. By equipping pupils with a systemic perspective in seeing how each of the parts (which refers to the set of generated ideas, writing tips, and the notion of plot with climax can be applied to any set of picture stimulus) is needed to construct the whole (which refers to the completed piece of written composition that not only describes each picture stimulus but also describes the transition between four consecutive pictures), it can develop and empower each pupil's rhetorical thought processes, thereby helping them improve in their composition writing. The expectation from using this structured and individualized approach is that a pupil should be able to appreciate the fact that English Composition Writing is both an opportunity and a constructive modelling process that enables him or

her to gain a better insight of a domain (the given set of picture stimuli that each pupil is required to write a narrative composition about) via the process of articulating, structuring and critically evaluating his or her storylines for that domain. Fourth, it demonstrates the cycles that one goes through when embarking on an action research journey. Further, the combination of the classroom-based Oral Discourse Approach and the individualised Dialectic Soft Systems Methodology approach, offers a complete learning experience for each pupil, that is problem-focused and context-specific. Apart from improving practice (in composition writing), it also strengthens a pupil's timeless qualities such as confidence, capacity to think systemically and realisation of his or her natural potential to learn. Finally, the concepts and approach used in this paper can also be applied to composition writing in other languages.

2171

FEMINIST SYSTEMIC INTERVENTION: INTEGRATING GENDER, NATURE, AND INCLUSION FOR SOCIAL CHANGE IN RURAL DEVELOPMENT

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Rain or shine, 365 days a year, thousands of women in rural regions of Nicaragua walk down slender dirt paths to their businesses nestled in nearby tropical hillsides. The women's businesses represent diverse market sectors producing predominantly agricultural products (e.g., cocoa, dairy) to be sold locally. However, as their production grows, the women start to sell their products at formal markets, hours away from their villages, with a longer-term ambition of international trade. These endeavours promise profoundly different futures for the entrepreneurs compared with their current realities. At best, the women could reap socio-economic rewards for themselves, educational opportunities for their children, abundant and healthy nutrition for their families, and environmental healing for their country. At worst, the collapse of these projects could produce successive generations of poverty and shattered dreams. Nevertheless, by participating in these small businesses, the women are, for better or for worse, charting a course of action that, once embarked upon, will forever alter their lives.

Over a four month period, design meetings and workshops were facilitated by this researcher and a team of students and faculty from the National Agrarian University in Managua, Nicaragua. Building on a Feminist Systems Thinking (FST) methodology (Stephens, Jacobson et al., 2010, Stephens, Jacobson et al., 2010, Stephens, 2012, Stephens, 2012, Stephens, 2013a, Stephens, 2013b, Stephens, 2013), the workshops provided opportunities for business owners (men and women) to conduct an analysis of their own micro and small enterprises in rural communities using FST. Throughout this process, the researcher sought to understand several research questions:

How can FST be further developed in a culturally relevant way?

What are the strengths and weaknesses of FST in these contexts?

What is the effect of including FST in a larger gender analysis process in the dairy industry in specific regions of Nicaragua?

Stephens's methodology (Stephens, Jacobson et al., 2010), based on a comparison of selected research on cultural ecofeminism and systems thinking, concludes that both share similar epistemological perspectives and goals, and have the potential to inform each other. An area of potential growth for systems thinking is to go beyond a general concern with power relations and engage more explicitly with situations where sexual oppression or gender-based marginalisation could be present. Conversely, the embracing of theoretical and methodological pluralism (widely explored in systems

thinking) could help work through epistemological differences that currently splinter feminism's influence (Stephens, Jacobson et al., 2010, Stephens, Jacobson et al., 2010, Stephens, 2012, Stephens, 2012).

The resulting methodology from this research, tentatively called Feminist Systemic Intervention (FSI), further developed the above ideas in the context of various practical and participative activities (e.g., observations, interviews, workshops) undertaken in Nicaragua with broad stakeholder groups and organizations.

This paper describes the process and findings of the introduction of systems thinking to rural communities, together with theoretical and methodological reflections on the implications for the new FSI.

2172

A SYSTEMIC GRC MATURITY MODEL

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This paper proposes a systemic model that will enable organizations to diagnose the state of maturity of its Governance, Risk and Compliance (GRC), from the perspective of the alignment and integration of processes. For its development it was necessary to conduct a thorough study of the concepts of GRC, identify the common elements that lead to their integration and their measurement, and understand the conceptual framework of Systems Theory and its relationship to the processes of organizational development.

The research to validate the model is based on a constructivist paradigm using a qualitative methodology. The state of maturity of GRC is diagnosed based on the perception of the alignment and integration of processes by different observers. The instrument designed to measure this perception was a survey of a representative number of people belonging to different functional areas within the organization. To determine a single measurement of the perception of the state of maturity of GRC, a triangulation process relied on quantitative methods was performed.

As a result of this research it is presented the conceptual definition of GRC maturity as an emergent property of the organization, which arises as a result of the alignment and integration of GRC processes. This definition is operationalized by defining a function that measures systemic GRC maturity depending on the degree of alignment and integration of processes. This function is implemented on an instrument that allows measurement of GRC maturity.

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REFLEXIVITY IN AGENT-BASED COMPUTATIONAL MODELS

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With the advent of computer technology, complexity approaches to study and transform social systems have been steadily gaining an important place in the social science and engineering communities over the years. The use of computational models of social systems has become an promising option for understanding social systems and for

exploring possibilities of change (e.g., Squazzoni, 2008). However, the popular complexity-related perspectives to study social systems are still strongly rooted in the physics tradition (cf. Castellano et al., 2009; Galam, 2012) and can be labelled as "physicalist" enterprises, in Mayr's sense, that is, the view that all nature obeys a single set of laws, and that therefore organisms are in no way different from inert matter (Mayr, 1996). Such an approach is especially problematic when the intention is to engineer, that is to transform, a social system since such a system is driven by contingent and changing decisions made by free agents. The assumption that such systems can be described by law-like statements easily ends up in mistaken, unsuccessful attempts that might even worsen the situation that is wanted to be improved in the first place.

Despite significant insights of physics-based models in the social sciences (e.g., Castellano et al., 2009), several differences between the physics tradition and the nature of social systems are not reconcilable (Fischer, 2013; Umpleby, 2007). For example, unlike entities in physics-inspired models of complex systems, social agents can reflect upon their decision rules and behaviour and change them over time. This is what we call reflexive agents.

The label "reflexivity" has different connotations in the literature, and is usually related to self-referencing statements (Umpleby, 2007). Umpleby (2007) also puts in contrast the equilibrium approach in economic theory with the reinforcing, out-of-equilibrium dynamics that reflexive systems might generate. Nonetheless, in referring to economist George Soros' ideas, Umpleby (2007) does not distinguish if reflexivity is a necessary or sufficient condition for out-of-equilibrium dynamics. In fact, we might infer that, in physics, out-of-equilibrium dynamics do not need to include reflexive agents. Similarly, we might say that boom-and-bust cycles might be either the result of the behaviour of reflexive agents or just oscillations that result from delayed feedback in dynamical systems models.

Nonetheless, in the consideration of computational models of social systems, it appears that individual-level behaviour has seldom been explicitly addressed as representing reflexive behaviour (exceptions are for instance Goldspink (2002) and Dopfer (2005)). We are interested in modelling agents' ability to modify their own behaviour by adopting different sets of decision rules. Thus, we understand reflexive agents as those who have meta-models of decisions and /or behaviour. The recognition that the behaviour of a system can be better characterized as the outcome of behavioural rules that affect behavioural rules , implies to question popular assumptions of "physicalism" such as: (i) the characterization of systems with immutable descriptions of logics of "behaviour"; (ii) the uniformity of nature—since the only possibility to meet the physicalist goal of "reliable" forecasts based on data, needs to assume that nature (or the observed system in this case) is uniform. This paper develops a theoretic perspective to understand how reflexive agents can be incorporated in computer simulation models, as well as we attempt to make a distinction between outcomes of reflexive and non-reflexive systems (Golspink and Kay, 2007). Our goal is to propose a dialogue that breaks away from the tradition of using statistical physics models as analogies to social systems, and propose alternatives to include the property of agent reflexivity (as we defined it above) in the study and engineering of social complex systems.

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THE MIND, CONSCIOUSNESS AND THE SELF

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Descartes famously distinguished between two types of substance: res extensa, the so called objective reality, and res cogitans, our conscious experience. On the contrary, in the energy, momentum, mass equation of Special Relativity:

$E2 = m2c4 + p2c2$

where E is energy, m is mass, p momentum and c the constant of the speed of light

the substance is one “Energy” and the solutions are two. The positive or forward-in-time solution describes energy that diverges from a cause, for example light diverging from a light bulb or heat spreading out from a heater. But in the negative solution, the energy diverges backward-in-time from a future cause. This, quite understandably, was considered an unacceptable solution since it implies retrocausality, which means that an effect occurs before its cause. Nevertheless, in 1941 the mathematician Luigi Fantappiè suddenly noticed that the properties of this solution perfectly match the mysterious qualities of life:

“I felt as if I were falling in an abyss, with incredible consequences and conclusions. It suddenly seemed as if the sky were falling apart, or at least the certainties on which mechanical science had based its assumptions. It appeared to me clear that these finalistic properties which lead to differentiation and complexity were real, and existed in nature, as I could recognize them in the living systems…opening consequences which were just incredible and which could deeply change the biological, medical, psychological, and social sciences."

In order to better understand the implications of the retrocausal solution it is important to note that the energy/momentum/mass equation predicts three types of time: causal time, retrocausal time and supercausal time. This classification of time recalls the ancient Greek division in: Kronos, Kairos and Aion, where: Kronos is the sequential causal time linked to our conscious experience, Kairos is at the basis of the ability to feel the future and to choose the most advantageous options and Aion describes the supercausal time, in which past, present and future coexist.

In 1942 Fantappiè published a small book titled: “The Unitary Theory of the Physical and Biological World” in which he shows that the “feeling of life” can be explained through the properties of the backward-in-time solution which are: energy concentration, an increase in differentiation and complexity, a reduction of entropy, the formation of structures, and an increase in order.

The combination of Fantappiè’s findings with the organization of time and causality predicted by the fundamental equations suggests that the “feeling of life” is immanent to all forms of life and it then organizes according to the properties of Kronos, Kairos and Aion (causal, retrocausal and supercausal time) giving place to the conscious mind, the unconscious mind and the superconscious mind.

Keywords: The Self, Consciousness, Mind, Unconscious Mind, Superconscious Mind, Heart, Retrocausality, Syntropy.

2175

IMMERSIVE AND INTERACTIVE E-LEARNING IN UNIVERSITIES ABSTRACT

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Educational systems in universities have changed very fast, e-learning is the most important change to improve the whole system in the last years. There are many specific technologies to be included in new solutions, but it is hard to select and integrate them in a combined Technology and Knowledge Management plan.

Then a first task is to study and develop several TIC´s applications to improve the learning process. But this effort is not enough for having a good system. Perhaps it is more important and harder to design and organize an educational system applying proper pedagogical principles, using many available contents of knowledge and combining all them in classrooms with many tools to create a dynamic interaction, immersive visualization, collaborative work and permanent evaluation .

Knowledge Managements help teachers achieve this objective of knowledge development. In universities, It is a combination of experience, values, specialized information and expert insight for creating and improving individual competencies. The purpose of this paper is to analyze the educational system in universities in order to define and use proper tools for integrating a new modernized system of e- Learning.

Keywords : Knowledge Management, Technology Management in universities.

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SYNTROPY AND SUSTAINABILITY

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In the 1920s the backward-in-time solutions of the fundamental equations of the universe were rejected as non-physical, since retrocausality was considered to be impossible. Then, in 1941, the mathematician Luigi Fantappiè noticed that the properties of these solutions are: energy concentration, the increase in differentiation and complexity, the reduction of entropy, the increase in cohesion and unity, the formation of structures and the increase in order. Listing these properties he remarked that they coincide with the properties of life, which the classical (time forward) approach is unable to explain. In 1942 Fantappiè published a small book titled: “The Unitary Theory of the Physical and Biological World” in which he suggests that the physical/mechanical world is governed by the forward-in-time solution and by the law of entropy, whereas life is governed by the backward-in-time solution and by a law symmetric to entropy which Fantappiè named syntropy (from the Greek words syn = converging and tropos = tendency).

The entropy/syntropy theory deals with energy and states that two transformations can effect energy: a forward-in-time transformation governed by the law of entropy and a backward-in-time transformation governed by the law of syntropy. Since energy is a fixed quantity which cannot be created or destroyed, but only transformed, the total amount of energy can be represented as the sum of energy in the syntropic state (concentrated) and energy in the entropic state (dispersed):

Total Energy = Syntropic Energy + Entropic Energy

Furthermore, because Energy is a constant value it can be replaced with the number 1 and the equation changes into:

1 = Syntropy + Entropy

which shows that entropy and syntropy are complementary polarities of the same unity:

Syntropy = 1 – Entropy Entropy = 1 – Syntropy

Entropic energy is governed by causality (causes that precede their effects) and it is for us visible, whereas syntropic energy is governed by retrocausality (effects that precede their causes) and it is for us invisible. The existence of two complementary forces, one diverging and one converging, one visible and one invisible, would be constantly at play in living systems and in its numerous forms of organization.

Since entropy is the tendency towards death, whereas syntropy is the tendency towards life, living systems in order to sustain themselves need to minimize entropy and to maximize syntropy. When entropy is high crises are experienced. When entropy is low crises diminish and wellbeing is experienced. According to this view, sustainability follows the syntropic rules which govern the invisible plane of reality and which Jung and Pauli named synchronicities.

Keywords: Essence of life, Sustainable futures, Laws of thermodynamics, Entropy & syntropy, Visible and Invisible.

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SCIENTIFIC RESEARCH FOR THE MEXICAN SATELLITE SYSTEM

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A technology Management Model for the Mexican Satellite System, based on concepts from different writers is proposed such as: management and technology management. This latter concept involves creation, dissemination, use and transfer of technology. At the next step a Systemic Planning Model for the Mexican Satellite System, is proposed, in order to contribute to technological development.

The Stages of Systemic Planning Model for the Mexican Satellite System are: 1 International analysis, 2 Satellite system .analysis, 3. Diagnosis of, national satellite system using the SWOT, 4.. Formulation and answer research questions 5. Proposed solution 6.Mission, vision, values and strategic objectives of the proposal, 7.Strategies, using SWOT: SO, ST, WO and WT combinations, 8. Action plan 9. Technological feasibility, 10.Technological development. From the analysis and diagnosis, it was found that one of the great strengths in our country is scientific research, including space developed since the 1940s, but it is isolated. It is proposed to found humanist satellite companies, to promote and preserve ecology consisting of self-financing, public, mixed or private initiative, that systemically integrates basic and applied scientific research, among other companies which are engaged in the design, construction and launch of satellites with the purpose of contributing to the technological development to provide an efficient, fast, safe and cheap service to meet the demands of domestic and international users.

The problem is that, in Mexico as in most developing nations, scientific research is not a systemically integrated industry. For this reason, it is impossible for space technology to develop.

Keywords: Model of Systemic Planning, Mexican Satellite System, technological development.

2179

SECURITY FROM A SYSTEMS THINKING PERSPECTIVE - APPLYING SOFT SYSTEMS METHODOLOGY TO THE ANALYSIS OF AN INFORMATION SECURITY INCIDENT

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Information security is a complicated problem while security breaches continue to manifest their complexities. According to the 2013 data breach and investigation report: “Security breaches are multifaceted problem and any one-dimensional attempt to describe them fails to adequately describe their complexity”. Even though most modern enterprises today spend enormous amount of resources on security and apply the latest security standards with strict policies in order to regulate and control the security process in their organisations incidents still occur frequently. No matter how tight the enterprise technical security controls are in place, we are still reading news about successful security breaches hitting major enterprises. What is interesting about these incidents is that they were not successfully committed because of a direct technical weakness or a malfunctioning hardware or software. Instead, attackers have achieved their malicious goals by targeting the human factor in these enterprises to have them unintentionally perform a malicious action that enable them to commit their attacks.

For instance, in a recent information security incident which occurred at the NewYork Times website, an attacker used social engineering and hacking skills to target a NewYork Times staff member to open a malicious email attachment to run a malicious code and performs illegal actions. What this incident appears to indicate is that the designer of the security system did not consider the “soft” factors when designing the enterprise security system.

Applying systems theory to information security enables security analysts to consider the socio-technical role of the security system instead of only focusing on the technical part. Systems theory can also equip security analysts with the skills required to have a holistic and abstract levels of understanding of the security problem at their organisations that in turn makes them capable of proactively defining and assessing existing vulnerabilities and suggesting mitigation strategies to protect existing systems against potential disruptions caused by adversaries.

In this paper we apply the Soft Systems Methodology (SSM) developed by Peter Checkland as a framework to diagnose a real case security incident that has hit the organisation one of the authors work for. Because the methodology was created in order to deal with unstructured situations where human beings are part of the socio-technical system, then we suggest it can be beneficial as well to understand under what conditions the attack has succeeded and what elements of the system and its environment should have been considered in order to mitigate and reduce the risk exposure. In this paper we define the security attack as a human activity transformation system that transforms a security event triggered by an attacker into a security breach that cause damage to the victim organisation. The attack system is modeled to include number of dependent activity sub-systems that interact with each other and with their environment including security control activity systems.

To the authors' knowledge, this paper is among first papers to provide analysis to a real information security incident using Checkland Soft Systems Methodology. The outcome of this paper, we hope, will contribute to both systems thinking and information security disciplines.

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TESTING A LAW OF OPTIMAL VARIETY AND ORDER FOR DEVELOPMENT, THROUGH ACTION RESEARCH ON PROFOUND MENTALLY RETARDED ADULTS

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The aim of this paper is to test the applicability of a law of optimal variety and order in a case of development. The theoretical background include the Aschby's laws of requisite variety and of experience together with the Millers' law of overload and underload of information stress that led to a law of optimal variety by Paritsis. After Prigogines' discovery of the contribution of order to evolution, Paritsis discussed the contribution of the variety and order to development. Namely, that there is an optimal variety and order that maximizes various forms of development such as evolution, learning and progress of science. In particular, that there is a combination of an optimal variety, that induces development and the amount of information, and of an optimal order, that induces development and reduces amount of information. In this way a maximization of development is expected without producing stress by overload of information, which stress has been found to reduce intelligence development. The sample comprised of 30 mentally retarded adults (15 in the control and 15 in the experimental group), living in residential houses, were used as a sample. Concerning the tool for measuring the outcome for the degree of development adaptive functioning was used, estimated through VILAND test. The method included during the action research, in the experimental group, a parallel increase of variety and order. On one hand a gradual increase in the variety of new experiences that in parallel increased the amount of information. On the other hand an increase of order, through repeated personal program of experiences, activities, places and persons involved, that in parallel decreased the amount of information prohibiting from an overload of information stress. The results show a statistically significant improvement of adaptive functioning in the experimental group, were the method of realizing, empirically, an optimal increase of order and variety was applied, compared with the control group. In conclusion this law of optimal variety and order which is based on valid theoretical grounds of systems and cybernetics is validated with an empirical prospective study for first time, according to our knowledge. The practical and empirical validation of this law could bring facilitation in cases of development including the economic, social and personal ones.

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EXPLORING THE VARIETY OF SYSTEMS SCIENCE IN THE CLASSROOM

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System thinking provides a different and better way of looking at how the reality nest the life. It differ from the traditional way of looking of academic disciplines, mainly avoiding the reductionist approach to complex problems. One reason to study Systems Science is that most of the systems are human activity systems, where humans play fundamental

rolls; therefore, understanding how system work it will make possible to anticipate the behaviour in the systems and co-evolve with them instead of being controlled by them.

We present a brief description on a lecturing-learning process of Systems Sciences using the proposed structural approach published in the Journals ISSS of the 55th Conference. The proposed structure, follows the domain of Science Model developed by Warfield, which helps the art of learning integrating the four main components of the Systems Sciences body of knowledge, of as follows:

- The domain of Systems Science
- The conceptual space and language of Systems Science
- The theoretical relations within Systems Science
- The methods of Systems Science

At the end of the paper we present an application of the didactic tool.

Keywords: Concepts, theory and methodology of Systems Science, Domain of Systems Science,

2184

AN ACTION RESEARCH STUDY ON USING ELEGANT TASKS FOR PRIMARY ONE PUPILS TO LEARN ART

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This action research study explored the use of Elegant Tasks for thirty primary one pupils from a neighbourhood school to learn Art. According to Sandra Kay (1998), an elegant task is an open-ended-problem approach that serves to elicit “creative thoughts’ and ‘elegant’ or ‘aesthetically meaningful’ solutions from pupils. Apart from making the teaching of art interesting, the application of Elegant Tasks help to amuse the pupils into developing an awareness of his or her own-style of thinking, its strong points and its weaknesses. Qualitative data were collected through focus group discussions. The findings from this study showed that pupils like the adoption of Elegant Tasks in their art lessons as they were given enough room to explore materials, make new discoveries, and work collaboratively in groups. Besides, this approach has also developed a strong sense of ownership and pride in their artworks as witnessed from pupils’ presentation of their artworks at the end of each elegant task topic.

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A CRITICALLY REFLEXIVE APPROACH FOR THE STUDY OF INNOVATIVE PROCESSES AND ACTIVITIES SHAPING STRATEGIC DECISIONS: CONDUCTING SYSTEMIC INTERVENTION BASED ON THE BOUNDARY CRITIQUE THEORY

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This paper empirically demonstrates the practical value of a reflexive approach for the study of innovative processes and activities that shape strategic decisions; the study is based on a systemic intervention project drawing on the boundary critique theory. The paper aims to redress the weakness of existing approaches for the study of strategy practices occurrence: that current approaches lack the ability to obtain the real human participation required in order to identify the social practices and patterns inherent in everyday business activities within an emergent environment. Most available approaches tend, as a result of this issue, to produce simplistic understandings of quite

complex social interactions. In effect, this leads to enormous challenges in understanding research that would prove most useful both in the intervention context and in designing approaches to related research issues.

Ultimately, this paper advocates that in order to understand how the intervention works better than traditional intervention approaches to address project thematic concerns and research issues, one must consider a flexible and responsive approach including the choice of appropriate methods. One cannot predict in advance what will become relevant or what the project will reveal; hence, the appropriateness and efficacy of the research approach employed to identify and address issues regarding the research problem depend upon making a distinction between two overarching processes: firstly, the actual field work activities in relation to the project, and secondly, the thesis project itself, which focuses on the research process and includes ascertaining whether particular actions and decisions respond to the likely emergence of activities and consequences.

This paper will begin by providing background about the research project and its context. Then, various approaches to conducting interventions will be discussed including the choice of research approach for this intervention study. The subsequent section will focus on the process of the intervention framework, which occurred through two phases: (i) identifying key issues and (ii) addressing key issues for improvement. Finally, the paper will conclude by providing a reflection on the process and outcomes of the research project in order to discern the lessons learned from undertaking this practical exercise.

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A SCAFFOLDING STRATEGY FOR HELPING LOWER SECONDARY SCIENCE STUDENTS CONSTRUCT SCIENTIFIC EXPLANATIONS FOR EXPERIMENTAL BASED QUESTIONS IN SCIENCE

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The study of Science in essence involves the explanation of phenomena by inferring the reasons for occurrences and justifying the significance of the observed event. This raises a challenge for educators: How can we equip students with the requisite knowledge, skills, and dispositions for answering science questions? This research study responds to this challenge by doing five things. First, it adopts a novel action strategy with reference to Feldman's approach to art criticism- DINE (whereby "D" is describe, "IN" is interpret, "E" is evaluate). Students adopt this action strategy to construct arguments and explanations needed for phenomena posed to them. Second, it incorporates bite-size classroom-teaching to equip students with the pre-requisite knowledge. During teaching, an educator teaches directly on a "need-to-know" basis and with focus on context that can help students move forward in their scientific inquiry with DINE. Third, it introduces a set of focal lessons for students to work on. Each focal lesson comprises of a set of step-by-step instructions and tasks to be carried out by students. Each task takes into consideration the appropriate zone of proximal development whereby the level of potential development is determined through problem solving in collaboration with fellow students (Vygotsky, 1978). Fourth, it provides the justifications for our integrated use of DINE, Bite-Size Teaching, and Focal Lesson as a collective whole via the Connective Approach as described in the works of Strawson (1992), Tay (2003), and Tay et al

(2010). Lastly, it demonstrates the cycles that one goes through when embarking on an action research journey.

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USING REFLECTION AND STORYTELLING TO INFORM EVIDENCE-BASED DECISIONS:

AN ACTION RESEARCH STUDY OF AUSTRALIAN PROJECT MANAGERS.

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The purpose of this paper is to examine decision-making in project management, and the considerations which project managers need to take into account in order to make informed evidence-based decisions. The specific aim of this paper is to present an understanding of how project managers use experiences, recalled through reflection and facilitated by storytelling, to make decisions.

The paper provides an insight into how project managers may utilize decision-making approaches to accommodate a balance between factual observation, other evidence, and a project manager's recollection and reconstruction of facts. The drive to embed formal, structured approaches to decision-making is discussed against a background of informal, ad hoc interpretation of experiences.

The research conducted by the author used an action research methodology to gather and analyze data through four interventions conducted with experienced project managers in Australia. The examination reveals that through reflecting on experiences relating to past projects, project managers make considered decisions. This approach to decision-making may be seen as paradoxical and interpreted as biased. Perhaps this is a valuable bias, which may provide an opportunity to extend the premise of an evidence-based management approach where the aim is to reduce bias.

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A SYSTEMS VIEW OF COMMUNITY ENGAGEMENT: EXPLORATION FOR SIMPLE RULES OF INTERACTION TO EXPLAIN COMMUNITY RESISTANCE IN LANDFILL SITING SITUATIONS

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Success within today's corporate environment is increasingly dependent upon the corporation's successful interaction with its community. Communities are increasingly aware of their rights and demand responsible treatment from Corporations. This paper looks specifically at the Community Engagement dynamics involved in Landfill Siting situations.

In the same manner that the flocking of birds or the structure of termite mounds emerge from what are relatively "simple" noncomplex activities, interactions and interdependencies; can we identify these noncomplex activities in situations of successful and unsuccessful landfill sitings? This paper begins the process of exploration and identification of noncomplex activities which occur in these situations. The purpose of this exploration is to add to the body of Community Engagement Theory in a meaningful and practical way through the use of Systems Concepts involving Complex Human Systems.

These concepts are those low level interactions which produce higher level processes - community resistance / acceptance - in multilayered complex systems. Also, the exploration will take note of the higher level system processes - quality of engagement i.e. Transformational, Transactional, Transitional - that constrain or induce the lower level system processes. Note will be taken of the coevolution of these system levels toward either a successful or unsuccessful siting situation.

The paper explores extant literature concerning Community and Community Engagement research in an effort to identify predominant and not so predominant thinking in the domain. Exploration in this domain of literature reveals many similar themes of interaction, interdependency and actions. The paper begins with a look at what is commonly or not so commonly defined as “Community”. Several definitions of varying perspective prevail including; Community as stakeholder, Community as groups, Communities of practice, Communities geographically defined, and Communities of individuals. A practical whilst perhaps not definitive definition of Community is proposed for the purposes of the exploration. Not surprisingly this definition is a synthesis of the theory to date interpreted through the lens of Systems theories.

Given a practical definition of Community, then, the paper turns to the literature to explore the differing actions, interactions and interdependencies peculiar to Community Engagement. Using the same method the author identifies a definition of Engagement from the literature and then turns the exploration toward the actions, interactions and interdependencies produced during Community Engagement. An emergent theme in the literature regarding Community Engagement is that of the “quality” of engagement. Although, this is found stated in several different manners, the author identifies key similarities and defines three qualities of engagement: Transactional, Transitional and Transformational. These types disaggregate into differing categories or qualities of engagement including; one way communication, two way communication, empowerment, inclusion, consensus building, multiparty dialogues, collaboration and “Guerilla” public relations, etc.

Exploration beyond the quality of Engagement encompasses additional themes in the literature including; NIMBY, NIABY, Community acceptance, Community Resistance, Stakeholder Theory, Bonding and Bridging Social Capital, Reflexive Modernization (Equity, trust, Participation), Risk to the Community and the corporation, etc. While the literature in the domain is vast there are several low systems level noncomplex interactivities and interdependencies that can be identified.

A Systems perspective of the low level system interdependencies and interactions leads one to the conclusion that pre-knowledge of the quality of engagement and its potential consequences in producing high level system processes can provide valuable strategic information to those involved in situations of landfill siting.

The paper concludes with a summation of this synthesis and a suggestion of field study to be carried out to further test the Community Engagement theory derived through this secondary research. The end result of field study will contribute greatly to the justification and use of engagement quality as an important corporate strategic tool.

Keywords: Systems Thinking, Community Engagement, Quality of Engagement, Landfill Siting

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ISSS 2014 DAILY MORNING ROUNDTABLE

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Everyone is invited to our ISSS 2014 daily morning RoundTable at George Washington University in Washington, DC.

We meet every morning, Monday through Friday, July 28-August 1, near the plenary sessions of the conference at George Washington University. The time will possibly be 8:00-9:00am. You are welcome to pick up coffee or breakfast nearby and bring it to the room. Join us every day, or whenever you like.

Our unique format is an eye-opening new practice in democracy. We spend 5 minutes settling in, listening to short readings and the suggested topic. We then spend 55 minutes on individual reflections or learning reports, time distributed equally among all present (e.g. 27 people = about 2 minutes each). The facilitator and/or group responds to individual comments only with "Thank You" to promote deeper listening and more time for individual reflections.

Each morning, the session is facilitated by a different volunteering facilitator selected from those in attendance. The facilitator-of-the-day suggests a topic of his or her choosing. In the past, our suggested topic for the first morning has been: “What situations and projects did you leave behind to come here, and what could happen here that would be valuable to you in your work and life back home?” On the second through fifth mornings, a suggested second or default topic is: “What did you experience yesterday that was interesting or important learning for you? In what way was it interesting or important?” or “Have you had an "a-ha" moment or perceptual shift during the conference? Please describe it and how you have been changed by it.”

Folk wisdom and compelling research indicate that participants experience surprising benefits from this activity after about four sessions. Our own experience with this format has resulted in the following theory: Just as we break the sound barrier when we travel faster than the speed of sound, we break the communication barrier when we hear 25 authentic viewpoints in 50 minutes.

This year, we will offer three new topic options to accompany the topic suggested by the facilitator of the day. The new topic options are those developed in the three-pronged approach (aka the Triple Action RoundTable). The first prong is the communication-barrier-breaking RoundTable. The second prong/topic is the triple bottom line (3BL) as applied to corporations, educational systems, and our own social systems. The third prong/topic is the TPO Thermostat metaphor, a refreshing new lens for leaders as they supervise or guide their system members.

We will begin to ask whether these three prongs increase benefits exponentially, to the third power. We will explore their potential and observe/assess their entry points: RoundTable (bottom up); TPO Thermostat lens (top-down), and 3BL (out-in-out or goals-outcomes-goals). Looking forward to experiencing this with you all!

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EMPLOYING BOUNDARY CRITIQUE TO ENHANCE JUDGMENTS OF QUALITY IN EVALUATION

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Evaluation practice aims to judge the merit, worth, or quality of a social program or policy. Often, stakeholders and the wider public hold differing views on and values regarding the social program or policy to be evaluated. In these situations, evaluators are faced with the challenge of selecting evidence and criteria for judging quality that fairly respond to stakeholders' differing perspectives. Traditionally, evaluators use prescriptive approaches, such as considering stated objectives, societal values, and evaluator expertise, and descriptive approaches, such as stakeholder surveys and focus groups, to identify values that can be used to anchor criteria for judging quality. However, these approaches do not consider the different evidence stakeholders draw on to support their perspectives. In order for evaluators to fully understand and fairly respond to different stakeholder perspectives in rendering evaluative judgments, evaluators need to consider the boundary judgments that determine the evidence and values relevant to stakeholders' perspectives. Boundary judgments mark the conceptual boundaries of what is included, excluded, and marginalized in a particular perspective on a situation. For example, in evaluation, how stakeholders understand the purpose, intended beneficiaries, and indicators of improvement of a program or policy are boundary judgments that influence the evidence and values considered relevant within their perspectives.

This paper examines the potential of the critical systems thinking framework of boundary critique for helping evaluators consider boundary judgments implicit in different stakeholders' perspectives. As discussed in critical systems thinking, the meaning and validity of any professional claim – such as an evaluative judgment of the quality of a social program or policy – depends on boundary judgments as to what evidence (i.e. facts, observations) and what or whose values (i.e. norms, standards) are considered relevant. Critical systems thinkers, including Ulrich (1988), Midgley (2000), and Reynolds (2007), argue that a process of surfacing and questioning boundary judgments, referred to as boundary critique, can help practitioners acknowledge the selectivity of their claims by making transparent the evidence and values bases for these claims. Evaluators could employ boundary critique in evaluation by 1) surfacing their own boundary judgments and those of the client and stakeholders 2) critically questioning all boundary judgments by examining their practical and ethical implications, and 3) making transparent boundary judgments used in selection of criteria and judgment of quality. This employment of boundary critique can help evaluators to select evidence and values that respond to different stakeholders' perspectives and justify boundary judgments used in evaluative claims about the quality of a social program or policy.

To illustrate the potential of boundary critique for enhancing judgments of quality in evaluation, I retrospectively apply boundary critique to a completed evaluation of a controversial coal education program. In this evaluation, stakeholders held widely differing views on and values related with the program. The program aimed to educate K-12 teachers and the wider public about coal and coal mining. The evaluation team attempted to respond to different stakeholders' perspectives by inviting them to participate in the evaluation and selecting criteria that reflected their values. Despite our efforts, we received criticism for excluding some stakeholder perspectives and the evidence about coal that mattered most to them. Reflecting on this evaluation, I contend that employing boundary critique could have helped us to surface and critically question

stakeholders' boundary judgments and justify the boundary judgments we used in our selection of criteria and judgment of quality.

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ASSESSMENT OF A SOCIO-TECHNICAL SYSTEM USING SYSTEMS PROCESS THEORY AND SYSTEMS PATHOLOGY

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This paper describes an application of the current state of the Systems Process Theory and Systems Pathologies Framework (SPT/SP) to a real-life socio-technical system. This exploratory investigation attempts to see what can be learned about: (a) the usefulness and usability of the SPT/SP to systems practitioners (what it says about bridging theory and praxis in general); b) the system of interest (improving praxis); and (c) how attempts at praxis can feedback and improve theory.

We will present a list of criteria for assessing theory → praxis "translation" relating SE to widespread attempts in modern medicine. We will also list practical goals and limits for applying systems theoretical findings to improving systems-level design and engineering. We will suggest a general protocol for "translating" abstract theoretical findings into workbench practices, for assessing reliability and ranges of applicability for theoretical findings, and for communicating across the growing chasm between theoreticians and practitioners. Final lists will include strengths and weaknesses of this approach and the possibilities and/or limits of "transferability" from this case study to other case studies.

We will be using the strategy that many engineers use to construct a tunnel through a massive mountain separating two valleys (in this case, theory vs. praxis). We will start simultaneously from both sides and meet in the middle. From the theory side, we select only a few promising specifics from 110 systems processes, hundreds of linkage propositions defining their mutual influences, and from specific systems pathologies of the SPT/SP framework to apply to the Thales problematique. On the application side, we construct a list of some of the observed or anticipated problems faced by the company. In both cases we are looking for exemplar insights and understanding from the general SPT/SP that might improve SOI performance.

An aspiration of the SPT/SP framework is to provide a theoretically rigorous approach for Systems Engineers to use in evaluating system designs and interventions. The widely-held view that there is currently an un-met need for a rigorous framework such as this is exemplified by the support currently expended for development of the SPT/SP framework by the ISSS and INCOSE via their joint Systems Sciences Working Group. The System of Interest (SOI) chosen for this investigation is the technical project and process review System within one of the Thales UK operating domains. The SOI reviews the technical development of a portfolio of engineering projects, covering the work of around 700 engineers. The SOI evaluates the developing designs for numerous technical systems, and determines what interventions are necessary, and is therefore thought to provide a relevant case study.

The SPT/SP framework is rooted in the evidence-based natural sciences yet the SOI is socio-technical. But the SPT/SP has numerous examples of processes and pathologies that are common to BOTH the natural (technical) world and the human-social-business

world. Subjectivity is likely unavoidable in the observation and analysis of the SOI, regardless of the evaluation framework that is applied. So this study leads to many questions. Are we as systems scientists and systems engineers suitably prepared to recognise when mixed-methods investigations are necessary? Are we equipped to carry them out while maintaining theoretical rigour? Can the SPT/SP framework provide a much needed common terminology to improve communication between these domains?

We end with insights into how the framework can simultaneously inform BOTH the (human-based) systems management of how a workforce PRODUCES a system as well as improves the PRODUCT system thus produced. We conclude with a dramatically expanded concept of systems engineering and the very large-scale systems problems to which it must be applied in the future.

Keywords: systems processes theory; systems processes; systems patterns; isomorphies; linkage propositions; systems applications

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BRINGING FORESIGHT INTO SYSTEMS THINKING: A THREE HORIZON APPROACH

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A primary goal of systemic intervention is the improvement of the system in question. The definition of the system in question is often itself a function of multiple stakeholders and is not a fixed object. Boundary critique can be helpful in clarifying the ambiguity and the power dynamics around agreeing what the system is that is to be improved and for whose interests.

However, there is another dimension of ambiguity which is time. Improvement implies some change from a present condition A to a better future condition B which eventually becomes a new present condition B. Where the environment is about to go through a significant change of pattern (a paradigm shift), the criteria of improvement will be different, depending which paradigm is being considered. For example, energy success in an unrestricted environment can be completely different from energy success in a restricted environment dominated by climate change.

In this paper I will introduce the idea of three ways of looking at the future using a method called the three horizons. It will point out three distinct ways of looking at the future, each of which will strongly colour boundary critique and therefore affect what is considered to be a successful or ‘improved’ system. The foresight framing suggests improvement to sustain the current system, improvement which is a disruptive innovation and may reconfigure the system and improvement which is transformative and may actually result in the collapse of the systems in question.

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A CRITICAL SYSTEMS EXPLORATION OF ETHICS IN THE CONTEXT OF NEGOTIATIONS

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In this paper we use a critical systems approach to develop a new perspective on how ethics can be conceived within negotiation practice as well as on the effects of power that this new ethical perspective might have. First we explore the main assumptions of the main schools of negotiation that have prevailed during the last decades in the Western world. We study their ethical assumptions and show how these assumptions are mainly of a consequentialist nature and suppose a tension between ethics and power. Here ethics is conceived mainly as a type of weakness that can diminish the negotiator's power. A second and recent approach conceives ethics in a deontological way within the context of negotiation. It explores how power can be derived from ethics, from adherence to a code of ethical principles and standards. Finally we propose a third and new perspective of ethics in the context of negotiations. This perspective is based on a virtue ethics conception. It stresses the character of the negotiators rather than consequences, rules, standards, or duties. We relate this conception to classical ethical conceptions that can be traced back to ancient Greek and Roman thinkers, but also to postmodern ethical conceptions such as Foucault's aesthetics of existence. We explore the relations between this virtue ethics conception and relations of power within a negotiation context by making reference to real negotiation cases.

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REDUCING ACQUISITION COST BY MINIMIZING THE REQUIREMENTS SOLUTION SPACE

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The purpose of this paper is to present a method for reducing acquisition cost by minimizing the solution space resulting from their respective requirements. Increased costs often result from rework and other issues related with system requirements. Issues often result when a single requirement can be satisfied by a number of feasible solutions. This becomes problematic when a chosen solution doesn't fit within the overall paradigm of the intended solution space, or when the given singular solution presents unintended consequences when combined with neighboring solutions from other requirements with the system of interest, system of system, or the environment of interest. If requirements can be mapped to constraints and/or degrees of freedom, it may be possible to develop a tool to identify if a given set of requirement possesses: 1) a high degree of freedom -thus resulting in a high number multiple solutions; 2) a solutions that interfere with adjoining system requirements, and; 3) potentially cause unintended consequences with regard to the system of interest, system of system, or the environment of interest.

This paper poses a theoretical relationship between critical requirements to their respective constraints, and presents and assigns a degree of freedom (DoF) nomenclature to these critical requirements and relates how its respective complexity

grows, as he DoF increases. This nomenclature will prove instrumental in providing the initial assessment to the number of potential solutions existing per system requirement. The paper will also establish a relation between the requirements DoF, complexity and cost.

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SYSTEMS PHILOSOPHY: UNDERSTANDING ETHICS, DEFENDING RELATIVISM, AND RECOGNIZING PROGRESS

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Systems philosophy provides a perspective for reconceptualizing moral values. Moral values were traditionally considered divine in origin, universal in application, and absolute in practice. More recently they have been seen as biological in origin, individual in application, and subjective in practice. Neither position satisfies.

Exploring a new ontology, systems philosophy offers an intriguing alternative. Avoiding the supernatural without reducing reality to matter, systems philosophy respects both nature and culture. Its reality includes "systems" – organized material components working to produce collectively experienced effects. Being wholes greater than the sums of their parts, systems incorporate qualitatively new attributes that cannot be located in their components. Among the qualitatively new attributes present in systems are rules for correlating component behaviors.

Understanding the rules correlating the behaviors of physical components requires a new epistemology. Most fundamentally, this new way of thinking must accommodate processes in which information is created as elements transform. It follows that instead of looking for the basis and meaning of moral values in the supernatural or biological, systems philosophy focuses on the organized wholes in which people live and new human attributes emerge.

This presentation argues that people acquire new attributes, including morality, through processes of societal self-organization. Moral values have bases in biology, but biological organisms survive or perish through natural selection. Organisms respond behaviorally to environmental challenges, processing information in biochemical terms of pleasure and pain. Membership in social systems introduces radically different considerations. Since societies solve problems individuals cannot solve for themselves, once societies exist people survive by successfully "fitting in" to functional social systems. Fitting in requires processing information about how individual actions affect others, and individual organisms are not biologically equipped to feel each other's pains and pleasures. Symbols can inform people of the feelings others have, however. Symbolizing the effects actions have on others, moral values do not give meaning to human lives but map the meanings of actions in social contexts. Using moral values, people process information in terms of good and evil.

Maps of meaning help people fit into social systems. Meanwhile, social systems use moral values to guide individuals into behavioral patterns replicating the roles and relationships constituting societies. As maps of specific systems, moral values vary from society to society. Moral values vary, systems philosophy suggests, because the behaviors and relationships moral values map match societal environments with distinct societal roles and relations. Since maps are not territories morals never perfectly match social realities. But maps need not be perfect to have significant effects. When maps, behaviors, and environments match satisfactorily, however, societies are stable. When behaviors become dysfunctional systems philosophy can facilitate reforms. Its relativism undermines universalism and absolutism without subverting the functional authority of

values. Relativism respects the role of morally-sanctioned behaviors and relations. Yet relativism denies things are the way they are by divine fiat or mechanical necessity. Instead, relativism says, with Boulding, “things are the way they are because they got that way.”

Having functional authority, systems-based morals indicate evolved social complexity and moral values like individuality, diversity, and freedom are linked. In fact, systems philosophy could interpret this linkage as historical evidence of (slow) moral progress. But systems philosophy also implies progress rests on treating individuals and societies as equally important. As problem solvers societies are essential to human survival and worth making sacrifices to preserve. And for societies to endure they must adapt, which requires encouraging innovation and risk-taking by nurturing individuals and enabling their fulfillment.

2220

ADVANCING THE SOCIAL SCIENCE PARADIGM SHIFT: BOULDING’S TYPOLOGY, TPO THEORY, AND THE TRIPLE ACTION ROUNDTABLE

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Paradigm shifts are slow to achieve. Even a paradigm shift in the hard science of astronomy, from geocentrism to heliocentrism, took centuries and great controversy for scientists to prove, and for society to accept. The new understanding, that the earth revolves around the sun and not vice versa, turned astronomy on its head, resulting in the need for reconceptualization and recalculation at all levels of theory and practice.

Evolution in the soft sciences, management and education theory, is even slower and more complex. Centuries ago, patriarchs had unlimited power over people under their care. Bureaucracy, an improvement over patriarchy, gave workers power over their personal lives. However, bureaucracy still assumed supervisors had the knowledge that had to be installed in the supervised. New paradigms such as participatory management and cooperative learning see workers and students as active participants in their workplaces and classrooms. This paradigm shift is still uncertain. The pendulum may swing too far, or there may be erroneous traces of the old paradigm. Corresponding examples are: 1) Teachers praise all students (workers too). This can result in equal treatment of mediocre and excellent work and lowered standards. 2) Cooperative students are obedient students (workers too). Cooperative is typically taken to mean obedient, an old-paradigm virtue. The true meaning of cooperative is working together, as observed in the prefix and word root—co and operative.

The dilemma in social system theory is ancient too. Plutarch in the first century said, “The mind is not a vessel to be filled, but a fire to be kindled.” Twenty centuries later, Boulding’s typology and TPO Theory advance the paradigm shift in the soft sciences of management and education significantly. They resolve the either-or conflict, provide the new unifying question and then answer it. In other words, the old/new paradigm dilemma “Which is right, top-down directive or bottom-up participatory policy?” (Cf. directive: controlling the supervised who are empty vessels to fill; or participatory: flexibility for the supervised who are fires to be kindled). The answer is “both.” The new question clarified by Boulding’s Typology is: “Which parts of a social system need to be controlled, and which parts left flexible?” Condensing Boulding’s nine system types into three, TPO Theory answers that “THINGS need to be controlled and PEOPLE need flexibility for best OUTCOMES.” Good indicators for effective social systems become adjustment capacities, hence a thermostat metaphor. We are still trudging, stumbling,

and evolving toward a new systems paradigm, which incorporates both old and new paradigm traits. The new understanding, that both directive and participatory methods are needed, that things can be controlled but people behave according to interiorly prescribed criteria, results in the need for reconceptualization at all levels of theory and practice.

Science is interested in behavioral laws and causes. Whether cause relates to gravity or human agency, both paradigm shifts here are proposed as hard science--a result of extensive empirical observation, rather than speculation.

This systems paradigm underpins the "Triple Action RoundTable," a proposed super tool for systemic school/workplace renewal. The tool's three prongs are: 1) RoundTable—a whole group activity with equal-turn democratic communication; 2) TPO Thermostat Guide—a thermostat metaphor for leaders to view and manage three modes of their organizations: OFF (planning); ON-Manual (agenda/resource delivery), and ON-Auto (maintaining the optimal work environment--metaphorically around 68 degrees—for participant self-regulation); and 3) Triple Bottom Line (3BL). 3BL corporations have financial, social, and environmental bottom lines, thus accountable for their impact on the whole society. Similarly, 3BL educators consider the whole learner: his/her cognitive, affective and psychomotor development. Respectively, these three prongs are 1) bottom-up; 2) top-down; and 3) in-out-in (i.e., current goals-3BL ideals/goals/intended outcomes-observed outcomes).

Keywords: social system design, paradigm shift, educational systems design

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SYSTEMIC APPROACH TO ADDRESS THE COST OVERRUN AND DELAY IN COMPLEX LARGE-SCALE HYDROPOWER PROJECTS – A CASE STUDY OF NEELAM-JEHLUM HYDROPOWER PROJECT IN PAKISTAN

Muhammad Abbas Choudhary and Muhammad Umair

In large and complex projects, absence of systems approach coupled with inadequate project planning before awarding the contract, inadequate implementation organization and insufficient information sharing, exchange, monitoring and control system among the parties involved create severe problems. Ultimately, large-scale projects go beyond the expected cost and time control limits. This study discusses major issues involved in Neelam-Jehlum Hydropower Project (NJHPP), a complex hydroelectricity generation project in Pakistan Public Sector environment (Installed Capacity: 969MW; Latest Approved Cost: US$ 3.186 billion and Project Implementation Period: 9 Years). International Federation of Consulting Engineers (FIDIC) based contract signed among three parties (The Contractor, The Engineer, The Employer) to complete the project against contractor's baseline plan.

The latest approved Baseline Plan of Project has been reviewed and analyzed using Variance Analysis and Trend Analysis techniques in Primavera project management software to assess the efforts made of the parties involved. It has been found that Project is 202% Cost overrun and 25% time delays from original contract award. The sizable cost difference and huge time delays are due to variance issues found in project timeline. The data collection was planned and collected by studying all the project related documents, Contractor and Engineer's progress reports, correspondences among the parties involved and open ended interview based discussions with Client senior project management engineers. The overall physical progress analyzed up to last status month was 56% at timeline which is less than expected progress. The continuous increase of variance issues has been found in completed activities start, finish and

baseline duration at timeline up to status month which have influenced on project present status. A large variance gap has been found in current in-progress activities of last two months timeline. This large variance gap is due to previous timeline issues in completed activities that highly influenced current progress rate. The schedule forecasted project completion time at project timeline up to status month depicts that there is a continuous increase of time delays. This continual increment of delays at each month of progress update was due to inappropriate corrective measures adopted by the project executing parties involved. The contingency float reserve in baseline plan has been consumed due to time delays in present in-progress activities and as a result negative float appears in most of the critical activities. The significant impact of identified causative factors has been found during quantitative survey findings. There are almost 17 most significant factors identified from 60 major and minor factors selected. Responsibilities are allocated according to the groups assigned to each causative factor of time and cost overrun. In addition to 60 identified factors tested and there impact analyzed during field interview discussions.

During the last 25 years since 1988 when the NJHPP was originally planned, the project has undergone major design, cost and time revisions. Our analyses indicate that NJHPP is multidimensional project and involves numerous technical, financial, and administrative parameters and groups of actors and agents. Such project involving thousands of activities, hundreds of work packages and dozens of sub-projects could only be successfully executed with systemic planning, analysis, design and implementation. NJHPP with the involvement of number of government ministries, federal, provincial and local organizations, hundreds of thousand inhabitants in the affected area, consortium of consultants, and consortium of banks and donors for syndicated financing, and number of prime contractors having major specialties and large number of sub-contractors generates a complex set of actions, interactions, coordination and feedback. The very complex projects of this size and scope warrants system thinking and application of system theory for successful completion.

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AN APPROACH FOR SOFTWARE ARCHITECTURE BY UNDERSTANDING VALUE REQUIREMENTS, DEVELOPING VALUE PROPOSITION, AND SUBSEQUENTLY REALIZING VALUE

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Software Architecture is both an activity (process) as well as the schema of fundamental things about a system (product). As an activity, architecture is the act of creating a representation of an unknown and original object whose properties (like technical aspects, formal and spatial structures) must be well enough understood in advance. As a product, software architecture is the structure of the components of a system, their interrelationships, externally visible properties of those components and principles and guidelines governing their design and evolution over time. Handling this duality and realizing architectural designs that improve the value of the solution within cost limitations; provisioning for evolution over the system lifetime; considering the needs of all stakeholders; and ensuring that the system is well matched to its environment are the typical responsibilities of Software Architects.

The outcome of Software Architecting process is Software Architecture. Traditionally, this process provides general guidance to the Software Architect and utilizes an envelope of practices and design patterns that govern the Software Architecture creation. Its purpose is to aid the Software Architect to synthesize a solution that satisfies the requirements and it is the responsibility of the Software Architect to identify the right practices/patterns necessary for creating an appropriate solution. While most of the existing practices look at developing an Architecture that satisfies the requirements identified by the Software Architect, we propose a value understanding, value proposition and value realization based approach for Software Architecting that is based on the value co-creation system that exists in the software development and usage life cycle.

In this paper, we discuss about the theoretical framework necessary for such a Value based approach. This theoretical framework is based on insights arrived at by asking four questions that needs to be answered for the software to succeed economically. These four questions are:

a) What are the benefits and how to discover, diagnose and understand these benefits?

b) What are the carriers for achieving these benefits? How can one derive these carriers of value?

c) What are the cumulative net benefits that should be delivered by the software?

d) How does one compose and deliver the software so as to realize these benefits?

The basis of the framework is the values viewpoint for creating and describing software. We illustrate our theoretical framework and approach by architecting a task automation system.

Keywords – Value, Quality, Value Understanding, Value Carriers, Value Proposition, Value Realization, Software Architecture, Software Architecting, Value based Approach

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SYSTEMS AND DESIGN: MUTUALLY INFLUENCING DISCIPLINES AND PRACTICES?

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When the Open University (UK) established a Technology Faculty in 1970 the founding Dean created a structure comprising disciplines of analysis and disciplines of synthesis, the latter being design and systems (based largely on general systems theory or GST). Newly appointed academics had to create what has become known as 'supported open learning' as well as establishing curricula in this mode for design and systems. In this paper, following Schön and Rein, I will argue that policy positions rest on underlying structures of belief, perception and appreciation which they call 'frames' and that framing choices apply as much to course/module developers as they do to researchers and/or policy makers. Framing choices create initial starting conditions that become conserved as lineages (pathway dependencies). I firstly examine the framing choices made by design and systems academics as they developed new supported open learning curricula in the 1970s and ask: what has been conserved with what implications? Manners of explaining, epistemological commitments and tribal (academic) controversies are touched upon.

In the first design course the claim was made that: "'design problems' are not like scientific, mathematical or logical problems, ..not like crosswords or guessing games, ..not like the problems of an artist or composer …they contain aspects of all these whilst

remaining distinct". Further, that in design: "..goals change, problem finding (not solving) …values pertain (i.e. what is meaningful to whom?), conscious and subconscious effort (i.e. not just rational), requires a strategy (or purposefulness) and spontaneity." Thus "these aspects of design problems make them akin to what Horst Rittel and Melvin Webber called 'wicked problems'. 'There are only satisfactory solutions …not correct solutions'….satisficing." In contrast the first systems course, 'Systems Behaviour' was framed or designed around a set of 'systems' in the world, (giving systems an ontological status: e.g., deep sea container ports; air traffic control; local government; structure and management of ecosystems etc. In 1980 a second course, T243 (Systems Organization: the management of complexity) adopted the work of Ackoff and Checkland, and unlike the design courses focused on Ackoffian messes and difficulties rather than Rittel and Webber's wicked and tame problem distinctions used in the design courses.

Examining this history, and the interplay of cybersystemic thinking and practice with design thinking and practice, suggests a need to recapture some of the ethos of the 1970s so as to address contemporary imperatives. The following questions are addressed: (i) What does contemporary systems and design course and student praxis look like? (ii) What research and scholarship – synergies exist between systems and design? (iii) What could a praxis of innovating and social transformation look like in the next decade based on systems and design understandings? and (iv) what does it mean for a systems practitioner to 'take a design turn'?

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SYSTEMIC APPROACH FOR CHANGE AGENT – A NEGOTIATED EVALUATION FRAMEWORK FOR THE SOCIAL DEVELOPMENT IN CHINA

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Being a social worker and researcher participating in the social development in China for years, I have always puzzled how collective intelligence and the impact can be organized. Based on my fieldwork experiences of translating an adolescent development program into a secondary school in Guangzhou, there are following hurdles against my organizing work. First, despite the Handover of Hong Kong has been done since 1997, it is still difficult for me, as a Hong Kong Chinese, building a trust with Chinese officials in developing the program that might vacillate their status quo. Censorship does exist throughout the process. Second, although I have eventually established a working relationship with an education officer, no common agenda and shared measurement among his colleagues and subordinates had been made at once. Third, the program has been developing at the school in general, but this should be partly because of the authoritative and bureaucratic culture in China from time immemorial. Fourth, there is an ethical dilemma for me to develop and evaluate the program at the same time; I may be biased on my personal interest of developing the program (e.g. getting my PhD degree) unconsciously. Last but not least, the context revealed is not an ideal environment for collecting reliable and validated data and findings, according to a linear thinking of scientific research like experimental design.

In facing of the complex situation aforementioned, I have formulated a negotiated evaluation framework, which is based on developmental evaluation and the conception of boundary critique in critical systems thinking. Generally speaking, developmental evaluation has been an alternative approach to manage the complex situation of translating a social program. It emphasizes on not standing for any position, but

mediating the dialogue among the stakeholders to construct a shared understanding and direction for the program development and evaluation. However, no specific guideline available in the literature to reveal the mediation process. Furthermore, Michael Quinn Patton, the author of developmental evaluation, also admitted that there may be an ethical challenge of mediating stakeholders for a consensus. In order to extend the utility of developmental evaluation, the conception of boundary critique is thus applied to understand the conflicting process in the following two aspects. Firstly, the process can be reframed as a marginalization of institutionalized tensions between sacred and profane discourses on the program development. Therefore, the key to managing the conflict process is to foster all the stakeholders involved to understand their own and the other's ethical stance so as to deliberate how the tension is maintained or changed by those people involved in the discussion of different discourses. Besides, all knowledge is limited and informed by non-neutral values and there is a close relationship between value and boundary judgment. As a result, there is not a must to uphold any best practice of program development and evaluation; it is also unnecessary to strike for achieving a consensus with all people involved to a particular intervention. The critical determinant of the legitimacy of translating the program becomes whether I have been deliberating my ethical reasoning to support the program development for myself and the others , allying the comrades with shared reasoning, and adjusting or insisting any tangible arrangement of the program development according to the ethical reasoning. As a result, my role as a researcher or evaluator is no longer a value-free facilitator or mediator but a negotiator. This is the role trying to persuade and compromise with the stakeholders for the program development according to the ethical reasoning deliberated. My example of using the framework and the limitations reflected will be provided in my full paper.

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TECHNOLOGY AS AN OBSERVING SYSTEM: A 2ND ORDER CYBERNETICS APPROACH

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The role of technology in modern society is becoming fundamental as the boundary between technological utilization and technological interference narrows. Technology penetrates the core of an ever-increasing number of application domains. It exerts considerable influence over institutions, often in subtle ways that cannot be fully understood, and the effects of which, cannot be easily demarcated. Also, the ever-expanding ecosystem of Information and Communication Technologies (ICTs) results in an emergent complexity with unpredictable consequences. This created a tension that has led to a heated debate over the past decades that explored the role between the technical and the social.

Some theorists subsume the technical into the social, others proclaim its domination, others its autonomy, while others suggest that it is a derivative of the social. Starting with Luhmann's remark that technology determines what we observe and what we do not observe, this paper takes the approach that infers there are multiple benefits by looking into how Systems Theory can provide a coherent theoretical platform upon which these interactions can be further explored. It provides a theoretical treatise that examines the conditions through which the systemic nature of technology can be inspected. Also, the

paper raises a series of questions that probe the nature of technological interference in other 'function systems' of society (such as the economy, science, politics, etc). To achieve this goal, a 2nd order cybernetics approach is employed (mostly influenced by the works of Niklas Luhmann), in order to both investigate and delineate the impact of technology as system. Toward that end, a variety of Information Systems (IS) influences are used as examples, opening the door to a complexity that emerges out of the interaction of technology with its socio-economic and political context. The paper strives to describe technology as an observing system within the context of 2nd order cybernetics, and looks into what could be the different possibilities for a binary code for the system of technology. Finally, the paper presents a framework that synthesizes relevant systems theoretical concepts in the context of the systemic character of technology.

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USING ORGANIZATIONAL DESIGN TO SPEED HUMAN EVOLUTION

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This research proposes an organizational design to capture collaborative creativity by holding a space for dynamic, emotional tension between four people. It is based on the assertion that in order to solve the wicked problems of today we must burst through the evolutionary and cultural obstacles to creativity and innovation which are caused by massive isolation and a dominance of 'group think' which kills honesty and authenticity.

Background

We are drowning in incredibly complex, wicked problems. The biologist, E.O. Wilson said it best when he wrote, "We have created a Star Wars civilization, with Stone Age emotions, medieval institutions, and god-like technology."

Evolving beyond our stone age emotions and upgrading our medieval institutions is the most wickedly complex problem of our age. I would submit that the baseline problem is a mental one in that we humans suffer from evolutionary and cultural obstacles to our natural state of creativity and connection.

The evolutionary truth is that people are genetically competitive with each other and naturally coercive which when coupled with 'fear of not being good enough" keeps many people from experiencing their creative, generative source. There are exceptions, of course, such as artists and as Buckminster Fuller said, "Geniuses are just people who had good mothers."

Couple these evolutionary factors with our cultural imprinting of disconnection and the end result is propagation of a global culture of materialism, individualism and structural violence which we see playing out in the news every day.

Bucky also wrote, "If you want to teach people a new way of thinking, don't bother trying to teach them. Instead, give them a tool, the use of which will lead to new ways of thinking."

The Tetra – 3-D Organizational Tool – A Crucible of Learning

Bucky perceived four and its geometric manifestation, the Tetrahedron, to be the simplest and most utilized structural system in the Universe. The Tetra is applying this structural system to human organizational design.

The Tetra is really very simple. It consists of 4 people, the nodes in a tetrahedron, who assume two different roles. One role is the 'Convenor' who's job is to convene the Tetra, select the participants and be the keeper of the mission, the guardian of the 'process'. The other three people have the role as the 'Decision Triad' who's job is to decide by simple majority rule on actions to fulfil the mission.

In the process all 4 participants will go on a courageous learning journey, boiling through their differences – their lack of self-understanding, their prejudice against 'other', to create a Unified Action Field, the qualities of which will be high energy, heightened awareness and a deep level of knowing. The popular term for this level of awareness is 'being in the zone'. Four people acting as one organism, four hearts beating as one will be shockingly effective at fulfilling the mission, at solving wicked problems.

By fostering an environment of authentic communication and dynamic tension simultaneously, my theory is that the Tetra will capture the energy of creative destruction so necessary to finding truly innovative solutions, while at the same time fostering a learning environment conducive to open hearted, holistic thinking. I envision The Tetra as a nuclear reactor of coordinated, creative, adaptable human organizational endeavour.

I believe that the Tetra aligns with Allenna Leonard's idea of cybernetics, or governance, as "a means to encourage and channel human behaviour for the common good" which she outlined in her seminal article, "Between Momentum and Control – A Dynamic Democracy".

To be clear, this model is untested. As Edward Deming said once, "All models are wrong, but some are useful." My hope is that this model will survive the test of scrutiny and adaptation to become useful.

2242

TOWARD A SYSTEMS TYPE STRUCTURE

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A system can only be understood holistically. If our goal is to understand systems we must develop holistic descriptions. That conclusion seems inescapable.

Systems occur naturally in hierarchies and interact with a context consisting mostly of other system hierarchies. Systems reside in large, highly interoperating networks, meaning that a truly holistic view of a system has no clear outer limit. The great complexity and scope of such systems present a barrier to reaching a holistic view. Surmounting this barrier should be a goal of systems thinking.

Starting from a system of interest and working upward and outward is not the only possible approach. A system influences its parts as well as vice-versa. Complementary to a bottom-up approach from a system of interest is a top-down approach starting with a large encompassing system.

All systems are part of the universe, about which much is now known. A top-down approach could start by examining the universe as a whole in terms of the types of systems it contains and how they are related. Indeed, the universe constitutes the ultimate whole. Starting with the whole, even a distant and immense whole, seems especially appropriate when seeking wholeness.

Of course, the universe can never be described in full detail, but it could be described from a systems perspective in a way that would facilitate all other system inquiries. The

universe embodies the general architecture and ground rules for the integration of all systems. Eventually top-down development and the many bottom-up inquiries would meet, enabling pieces of the puzzle to fall into place.

Much valuable systems knowledge is available but it is highly fragmented. Unification is the only remedy for fragmentation. A single top-down approach would provide unification in the form of a common framework and dialect into which all other knowledge can be fit and made coherent. The universe is coherent; otherwise science could never succeed. The fact that our descriptions are not coherent must be the fault of our descriptions not of reality. Hence, in principle they can be fixed and a common coherent description developed.

This paper addresses a universal holistic view through a global system type structure. The type structure is represented in the form of a Unified Modeling Language (UML) generalization-specialization hierarchy, a well-proven approach.

System thinkers have repeatedly called for a comprehensive system classification, but to my knowledge none exists. The notion of a system is extremely general and so has a great many variants. Many definitions of particular system types and partial type structures exist, but no comprehensive, coherent structure. A coherent universe must allow a coherent description given the right approach; here we consider one. A global system type structure is an incomplete and insufficient holistic description but it provides a good starting point.

This paper addresses both a preliminary system type structure and the kind of approach needed to develop and perfect it. It also calls for collaboration to go forward with the project.

2243

SPT-BASED SYSTEMS PATHOLOGY: TEST OF CONCEPT USING HEALTHY-PATTERN COMPARED TO DYSFUNCTION PATTERNS IN REAL SYSTEMS

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A new, top-down Systems Pathology (SP) is one of the most interesting and potentially useful spin-offs from the Systems Processes Theory (SPT), a general theory of systems.

SPT-based systems pathology presents a heretofore unprecedented and detailed taxonomy of classes or categories of dysfunctions of systems. Each taxon class is based on the dysfunction of the steps in a particular systems process of a set of 50 to 110 candidate systems processes active in normal functioning systems. As the systems processes are isomorphic (similar or universal across a very wide range of types, disciplines, domains, and scales of systems), the described pathologies are hypothesized to also be universal. Knowledge of these potential dysfunctions could serve systems designers and engineers by alerting them to constructs to avoid or ways to correct errors in currently dysfunctioning large-scale, complex systems.

The approach in this paper will be to select and examine in much greater detail a few specific cases of healthy:less healthy, normal:dysfunctional “pairs” to explore. For each paired case study we will describe the normal systems process, its normal steps, features, and functions and compare these with specifically known pathologies in real systems. We will then attempt to diagnose how the errors could be avoided in the design

stage or fixed post-facto. In this way we will be attempting to not only provide concrete examples of systems pathology, but also create examples that test the feasibility of the concept as well as provide a protocol for others to follow. We hope to attract others to research the theory aspects of systems pathology as well as attempt the praxis aspects.

This paper will also provide a working definition for “healthy” and the opposing case of “pathology” for systems in general as used by the SPT-SP. It will describe how we might jump start systems engineering and systems science by learning the lessons and adopting the successes of the huge and ancient biomedical industry who study and fix pathologies of the complex human body system. The paper will include caveats warning about shallow application of the proposed top-down systems pathology. It will end by describing ways to develop this new specialty, enable its “translation” from abstract theory to praxis, and its relation to crisis societal problems we now face.

Keywords: systems processes theory; systems processes; systems patterns; isomorphies; linkage propositions; systems pathology

2245

SEVEN ALTERNATIVE MODELS OR TOOLS: FOR USING OR APPLYING SYSTEMS PROCESSES THEORY (SPT)

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The SPT Collaborative currently consists of more than a dozen systems engineers and systems scientists including graduate students who range from those interested in advancing pure general theories of systems to those interested more in applying such theories to practical human problems, business and industry. To apply such a detailed theory and science of systems, one needs tools or models to help organize, visualize and communicate the many components of the SPT. This Collaborative estimates that applications will generate questions that improve the theory while those improvements to theory will also expand and advance the much-needed design, production, testing, and curation of systems.

Because details of the SPT are still being produced and documented, it is still too early to settle on one approach to its modeling. The Collaborative is examining several approaches at the “test of concept” stage. So the Collaborative is simultaneously trying out these seven different tools or approaches: (1) a feasibility study of a UML-XML-SysML Descriptive Model restricted to a representative selection of three systems processes as test of concept (Tom Marzolf); (2) initiation of a Prolog-based AI Expert System (Troncale); (3) translating SPT to a more SE-friendly S* Framework devised by (Schindel, Marzolf, Smith); (4) an attempt at writing Object Oriented Executable Models (Friendshuh); (5) translation of SPT to SE architecting using Monterrey PHOENIX [MP] (Giammarco); (6) examining the potential for an artificial-lifelike spontaneous emergence of the SPT in virtual computer space (Friendshuh); and (7) analysis of SPT networks of influence using Integrative Propositional Analysis as a tool (Wallis).

This paper and presentation will introduce each of these approaches, describe their features, compare their presumed strengths and weaknesses, and imagine their roles in possible improvement of SPT theory or applications. These comparisons will help answer the question of whether or not a hybrid of several tools/models would be superior to reliance on one approach. It will also present and analyze the many new research questions and issues that each attempt at modeling or tool-making has revealed. These

questions probe how systems work and don't work and penetrate to a deeper level of understanding of systems origins and sustainability. The paper will end with a look to future work using a wide range of institutional innovations that include the distributed SPT Collaborative, the ISGE (Integrated Science UG General Education Program), a 23-campus Institute on systems (ISISTEM), a federation of Pacific Rim Complex Systems Institutes, retirement clusters, crowdsourcing, MOOCs, and SE graduate education programs. Potential funding sources will be identified and evaluated for some of these.

Keywords: systems processes theory; systems processes; systems patterns; isomorphies; linkage propositions; systems applications, systems models, systems tools, systems engineering; models and modeling

2246

BEYOND SYSTEMS "THINKING" TO A SCIENCE OF SYSTEMS PROCESSES ENGINEERING: SIMILARITIES, DIFFERENCES & EFFECTS ON RESEARCH TO APPLICATIONS

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Systems Thinking is a phrase often used in the systems science and systems engineering fields. In fact, in a range of conferences (IS's, IW's, CSER) systems engineering (SE) seems to use the term exclusively to represent all domains of the systems approach. However, the available knowledge important to near-future SE and systems science praxis is much broader than that implied by the term Systems Thinking. The main point of this paper is that "systems thinking" and "systems science" are used interchangeably when they are actually considerably different. Both of these terms are also considerably different from "systems philosophy." Conflating all of these distinct systems domains leads to miscommunication, lack of integration, and error.

This paper explores the similarities and differences between the thread of research and researchers represented in systems thinking as contrasted with the thread of research and researchers represented in the newer field of systems science. It argues that it is crucial for the future of systems engineering that the field of SE recognizes that there are projects, problems, funding, and need for a broader view of SE. This expanded view of SE includes husbanding and repair of a wide range of natural systems, even involves hybrid human-natural systems, and so will require a deeper view of how systems work and don't work than simply project management.

The attitude expressed here retains a deep respect for the importance of the human systems knowledge represented by systems thinking and its human systems management tools and techniques. So it also respects the current attitude of SEs to systems thinking. But the hoped for role of Systems Science is to complement, not replace Systems Thinking. This paper argues that perhaps the best place to do verifiable research on how systems work may not be human systems management and explains why. It argues for a natural systems knowledge base on how systems work to be sustainable and how they fail. It would be useful to add this uniquely different knowledge base to that accumulated in systems thinking. It posits and describes a non-anthropomorphic set of patterns learned from comparing a very wide range of natural systems that have tested architectures and universals for billions of years independent of the existence of humans.

As a result there are instructive differences, even opposite views on what works best between standard systems thinking approaches and natural systems science approaches. Shouldn't working SEs have a knowledge of these similarities and differences to inform their use of both sets of tools and knowledge bases? At present there exists a great imbalance of knowledge and application between systems thinking and systems science. This paper will discuss why there is even a tradition of opposition between the two that inhibits cross-communication and comparison. The ultimate goal of the paper is to envision a future where there is an integration or synthesis between the results of systems thinking and science rather than a chasm.

Keywords: systems thinking, systems science, science of systems, systems philosophy, systems management, systems movements, systems domains

2248

TECHNOLOGY MANAGEMENT THROUGH SPACE AGENCIES

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Technology management is the process of directing all activities geared to a public or private institution to make the most efficient use of technology.

Technology is created through joint expertise, scientifically arranged, to design and create goods and/or services that facilitate daily life. These skills are acquired in educational institutions and finally applied in technological development industry by acquisition or through research. Within space technology, this can be done through space agencies.

In this paper the major space agencies are: National Aeronautics and Space Administration (NASA), Russian Federal Space Agency (ROSCOSMOS), China National Space Administration (CNSA) and European Space Agency (ESA), which systemically work with industry and academia integrating basic and applied scientific research in each country.

The Mexican Space Agency (AEM) is the youngest space agency. Unlike its predecessors, it has failed to integrate basic and applied scientific research to the productive sector as demonstrated throughout this document.

Keywords: Technological Development, Space Agencies, NASA, ROSCOSMOS, Mexican Space Agency.

2249

DEVELOPMENTS IN CRITICAL SYSTEMS THEORY: ON PARADIGMS AND INCOMMENSURABILITY

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This paper describes an investigation of the body of systems theory around the still unresolved issue of incommensurability between theories of different onto-epistemological paradigms. It chronicles 19 developments in systems thinking which attempt to incorporate multimethodological approaches to systemic research, and design into coherent theories with the aim of improving systemic practice. With the advantage of hindsight, this research explains how each newly developed theory helped to advance

critical systems thinking, from the creation and evolution of the critical-emancipatory paradigm through the increase in our sophistication of understanding what it means to act multimethodologically, across paradigms. The paper concludes by describing yet another attempt to move toward the establishment of a coherent theory for pluralism in spite of the incommensurability problem. Our ultimate objective is to advance new theory which may lead in practical ways to improved outcomes for systemic practice.

Keywords: multiparadigm; multimethodology; systemic intervention; systems theory; critical systems thinking

2252

PLURALITY OF MEANINGS IN AN INTERVENTION: AN "INTENTIONALLY COMPLEX" ACCOUNT

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This paper's proposition is that diverse meanings emerge in an intervention process. This plurality shows with aspects such as the understanding of concepts, or the use of methodologies. The empirical base of the argument is the account of several planning sessions by a team of practitioners. Their sessions were alternating with the workshops carried out with their clients. It shows how meanings evolve. They are always changing and interacting with each other. The theoretical argument approaches intentions as complex adaptive systems. Over this basis, the account shows an intervention process in which the intentions of the actors interplay, paths of action emerge, some of them get stronger, and some of them disappear. The system cause, guide and sustain forthcoming actions. It takes priority over the logic of its elements. Then it forces and changes the meaning ascribed to concepts and methodologies. The analysis of the case suggests two ideas. First, methodologies do not control meaning. Negotiated intentions decide the meaning. This in turns influences over the selection of methodologies and the way in which they are used. Second, actors are important. They have a central role in the process. This demands awareness and reflective practice from the practitioner, but also opens possibilities in the form of more flexible and creative practice.

2253

A CONCEPTUAL MODEL OF SYSTEMS THINKING LEADERSHIP IN COMMUNITY COLLEGES

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The pluralistic and often competing goals of myriad constituents, the changing demographics of students, the uncertainty of funding, and the growing demands for accountability from stakeholders have increased the complexity of systems which community college leaders must manage. Emerging from the recent literature on community colleges is a call for new models of leadership in the context of leading in an increasingly uncertain and complex environment. Systems thinking offers a means to help leaders respond to these growing organizational complexities and move leadership from a traditional bureaucratic model to a more adaptive model better suited for today's dynamic community colleges. Despite a robust body of literature on systems thinking in myriad fields, there is comparatively scant evidence of systems thinking's application to organizational management or leadership per se in higher education and even less in community colleges. Hence, a systematic review of literature on systems thinking and

complexity theory and their application in higher education was bolstered with evidence from healthcare. Findings reveal three reoccurring ways in which leaders apply systems thinking processes for improving organizational performance. A conceptual model for systems thinking leadership is proposed in which the three processes, characterized as discovery, framing, and action, can be enacted either individually or sequentially for enhancing organizational performance. The model draws upon boundary critique, critical systems thinking, systemic intervention, total systems intervention, systems dynamics, soft systems methodology, complexity theory and complex adaptive systems, yet uses language more readily identifiable and accessible to community college practitioners to encourage the use of these systemic practices. Systems Thinking Leadership, as proposed in this paper, provides a framework for community college leaders—presidents, chief academic officers, deans, department chairs, and faculty—to view their organization through a systems lens, and to enact and engage the adaptive and participatory practices of discovery, framing, and action for improving organizational performance.

Keywords: Systems Thinking, Community Colleges, Leadership, Higher Education, Complexity

2257

A QUALITATIVE TRANSDISCIPLINARY PARTICIPATORY ACTION-RESEARCH APPROACH, TOWARD THE SYSTEMIC TRANSFORMATION OF THE EDUCATIONAL PROCESS

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The larger system is the real world. It is the framework, or the reference context for a viable process of open systems intervention. The educative and cultural system is a very complex system for a systemic transformation process. We can use a cybernetic Participative Action Research, PAR process, to change a particular educational process with the use of a critical, and propositive approach. The process of change can be a qualitative small scale application. The form of knowledge for a participatory process of transformation, should be transdisciplinary, to include the different types of knowledge of a relevant and plural group of social actors involved in the educational process.

The systemic process of transformation is a cybernetic Participatory Action-Research, or PAR process (Fals Borda, 1998). Through this process of change we link the auto, or internal system, with the eco or external system as a creative process or auto-eco organization (Morin, 1999). This is a qualitative participative process for the integral transformation of an educational process with the intervention of relevant social actors. It can address in the educational system the critical social and environmental problematic situations.

In this paper we present a brief description of a recent application in an alternative educational network. This qualitative complex organization is organized by an independent network of conscious social actors involved in different levels of the educational process at many public and private educative institutions in Mexico, and in other countries. The name of the mexican network is: Consejo de Transformacion Educativa, CTE, or Education Transformation Council, ETC. It is a qualitative small scale process for the systemic transformation of the mexican educational process, it is an alternative social laboratory of change.

Keywords: Action-research process, auto-eco-organization, plocal cybernetic process, participative grass roots process, transdisciplinary knowledge.

2261

TEACHING LIVING SYSTEMS AWARENESS IN ONLINE AND HYBRID FORMATS: STRATEGIES AND LESSONS LEARNED ACROSS DISCIPLINES

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This paper introduces an instructional design model of teaching living systems awareness through multiple ways of knowing and then offers insights from the author's own teaching practice. According to this model and the author's experience, it is possible to design learning experiences that mimic an ecological or living system in which learners fully experience the group as a living, vibrant, organic, and self-organizing (autopoietic) whole. This is also true for online and hybrid formats. Designing such learning experiences is an integrative challenge, however, that needs to take multiple levels of educational design into account: 1) the design of visible and invisible learning spaces, 2) the pacing and flow according to nature's rhythms, 3) the integration of creative expression from the whole person, 4) the engagement of the cognitive-rational mind across disciplines, and 5) the integration of living systems awareness into the learner's real life practice. If all these levels mimic and stimulate living systems dynamics, learners are more likely to co-create life-sustaining ideas, designs and structures urgently needed in an increasingly unpredictable world. A transition to this multi-level teaching design does not need to occur all at once, however. Transformative learning toward greater systems awareness can be achieved even if only several of these five instructional design levels are initially considered.

This multi-level design approach was first introduced in the author's dissertation Nature as Guide to Vibrant Learning – a Living Systems Framework for Academic Learning Experience Design toward a Vibrant Sustainable World. This paper documents key insights and lessons learned from applying this model in the author's own teaching practice, from community-college to Masters-level students across disciplines. Examples are provided from the following courses: "Human Values and Ethics" taught at Laney College, an inner-city community college; "Global Contexts in 21st Century Leadership", a systems-based course taught at the St. Mary's College of California Masters in Leadership Program, "Foundations in Community Development", taught at the Community and Regional Planning Program at the University of New Mexico, and "Consciousness, Creativity, and Transformation", taught at the Liberal Studies Program at John F. Kennedy University.

Keywords: living systems; self-organization; autopoiesis; sustainability education; transformative learning; multiple ways of knowing; educational systems design

2263

THE ROLE OF SYSTEMS MODELS IN SUPPORTING THE FORMATION OF INTERDISCIPLINARY RESEARCH TEAMS

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The need for interdisciplinary research to address the grand challenges of our age and the significant advances that can be made through such projects are long recognised and make worthwhile the study of how such teams are formed. This is a case based paper about the formation of an interdisciplinary research team and the role that a systems model, played in this process. The interdisciplinary team (drawing together researchers in marine biology, economics and management systems) was seeking to establish a basis for collaborative working: all participants anticipated that there might be an expected gain from their collaboration and cooperation in future research projects but felt that they first needed to establish a basis of common understanding. The case focuses on a participatory modelling workshop that the team engaged in which involved using a systems model, Holling's panarchy, to explore the behaviour of linked natural, social and designed systems (to give a focus to the workshop, the participants examined a local site that they already had knowledge of, Flamborough Head, a UK marine site which holds an EU designation as a Special Area of Conservation). The panarchy model was chosen because it was known to but little understood by all and their exploration and use of it revealed different meanings according to participant's different academic and professional backgrounds. In this paper it will be argued that models, such as panarchy, may be considered to be boundary objects, providing a platform for researchers from different disciplines to co-operate without requiring them to abandon their distinctive academic paradigms. Hence it is argued that such models can play an important role in the formation of interdisciplinary research teams.

2264

CIVILIZATION LEVEL INDEX (CLI): A SYSTEMIC INSTRUMENT FOR MEASURING THE LEVEL OF DEVELOPMENT, OR HOW HUMAN ARE WE ACTUALLY BECOMING

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It is a consensus now that GNP or GDP is not a good indicator for a country's development. GNH, Gross National Happiness, defined and promoted by the King of Bhutan in 1972, expands our attention from economic production to include sustainability, cultural values, environment, and good governance. It is an improvement over GNP/GDP for sure, but is still not satisfying from point of view of a system scientist. GPI, Genuine Progress Indicator, is another candidate replacing GNP/GDP, emphasizing resource depletion, carbon footprints etc. Med Jones proposed a 7-dimension index function to define the "second-generation GNH," including wellness of economic, environmental, physical, mental, workplace, social and political. Nevertheless, the author suggested that the usefulness and helpfulness of all of the above are limited to only the elite group of a society, i.e., the kings, the presidents, ministers and the official experts. Instead, in order for such an index to serve as a true change agent, i.e. a self-organization process agent, it needs to be available to grass root activists, younger generation, college students, or even teenagers, who have some

basic education in system thinking. It will be at the very root of a society that such knowledge of such index would become effectively influencing people's daily behaviors.

Therefore, in this paper the author outline a systemic index that is understandable, useable for the common public, younger generation, college and high school students, as in interesting tool to measure not only the immediate society they live in, but also to compare different societies, cultures, and yes, civilizations. This work is hopefully compatible with the work of ISSS apithology community, in terms of facilitating us to understand how well we're doing as human or how are we actually becoming more human.

Instead of previous efforts in finding better alternatives of GNP/GDP, of trying to come up a "laundry list" as holistic as possible, the author uses a theory of multi-layer self-organization as guidance, while incorporating elements from previous efforts, to design this systemic index. The idea is that it needs to be down-to-earthly simple, so that a teenager can use it to view his immediate society, but in the same time as comprehensive as possible in terms of the alignment to the mainstream civilization of this planet.

CLI Measurement Matrix (First Draft Outline)

The author designed one simple questionnaire, aiming to establish a ration scale if possible, or an interval scale, or at least an ordinal scale, for each of the following categories. The author meant to discuss the details of these measuring instruments with the colleagues in ISSS and finalize the design after the conference.

Dimensions of Achievements

Music

Art

Literature

Drama

Architecture

Mathematics

Philosophy

Religion

Science

Technology & Engineering

Moral standard level in average member

Philanthropic establishment & humane concerns (level of violence observable)

Dimensions of Individual Living Condition

Average life span of average individual

How clean is an average individual

Healthcare indicators

Human rights indicators

Freedom indicators

Dimensions of Individual Life Capacity

Experiential Opportunities: Travel

Language: Cognitive Resolution

Language: Available Knowledge

Education indicators: Types & Levels

Thinking/logic/cognition capacity

Dimensions of Group Capacity/Organizational Efficiency

History (Group Memory): Time, Area, Quality

How People Make Decisions

Communication Efficiency

Organizational Efficiency

Behavioral pattern/Self-organizing Code in groups

Similar to Myers-Briggs Personality Type Indicator, which has improved the public understanding of human individuals and their interactions, the author hope that CLI would improve the public understanding of human civilizations, and would lead to more rational approaches to deal with the differences among civilizations, more fruitful interactions in building a better planet.

Keywords: Civilization Level Index, Multi-Layer Self-organization, Measurement

2265

ADAPTIVE CAPACITY IN PROJECT TEAMS

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This paper presents a theoretical proposition for understanding adaptive capacity in project teams using a three-legged model. The model's three legs are based upon theoretically pluralistic approach including group development, hierarchy theory, and attachment theory. In broad terms, adaptive capacity is defined as the ability of a system to adapt in a changing environment. In human social systems, it is defined organizational learning through stored knowledge and experience, creative flexibility in decision making and problem resolution, and responsive organizational structures that consider the needs of all stakeholders. The purpose of this discussion is to explore the role of adaptive capacity in teams, an essential aspect of understanding adaptation in social systems and to clarify its role in group development under adverse conditions, specifically to ascertain social strategies of resilience. Research results have found that adaptation in project teams occurs through changes in hierarchical structures and behavioral norms. The first leg is a phasic model (forming, storming, norming, performing, and adjourning) of Group Development Theory, which explicates group activity around the adoption of ideas and norms as an important inflection point in the establishment of group cohesion. The critical juncture occurs between storming and norming, while the group tests ideas and behaviors to determine its threshold or tolerance level for conflict and competition. It is this inflection point when team members establish the ways they will work together. "How we work together" encompasses acceptable behaviors as norms, as well as operating processes and frameworks as hierarchical structures to get the group's goals accomplished. Some teams get stuck in the storming phase by focusing on minutiae of conflict and never coalesce. Others find mutually acceptable ways to work together and develop a plan to work toward the group's goals. At this point, the group moves from storming to norming. It is marked by a psychological shift by team members from championing one's individual ideas and goals to advocating for the group's vision and goals. Team members choose to conform to or reject established norms. A team's threshold for acceptable behavior depends on tolerance of confrontation and conflict. Those who conform operate successfully within the team. Those who test the threshold beyond its tolerance are rejected, sometimes through scapegoating, isolation, or dismissal. The team's coalesces and establishes a functional cohesion based upon its norms. It is also the way the group's "pecking order,"

power dynamic, and hierarchical structure is established. These dynamics closely align with Hierarchy Theory, the second leg of the model.

The attribution that conforming to norms is assurance of safety, security, acceptance, and acknowledgement within a group speaks directly to early human development theories, such as Attachment Theory. Bowlby thought human attachment aids survival and has an evolutionary component, stating, "The propensity to make strong emotional bonds to particular individuals [is] a basic component of human nature." Bowlby characterized attachment as having four characteristics, which include proximity maintenance (desire to be close to the people with whom we are attached), safe haven (returning to the attachment figure for comfort and safety in the face of a fear or threat), secure base (the attachment figure acts as a base of security from which the child can explore the surrounding environment) and separation distress (anxiety occurs in the absence of the attachment figure). Two of the characteristics and the three propositions of Attachment Theory, in addition to aspects systems theory, which underpin it, provide the third theoretical leg of the stool. This paper discusses how the three theories are interrelated and contribute to understanding adaptive capacity in teams, which impacts organizational resilience.

2266

LEVERAGE POINTS IN SYSTEMIC CHANGE, AN EMPIRICAL EVALUATION OF MEADOWS TAXONOMY

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A system intervention is usually done with the view of changing some aspect of the system. That aspect might be the boundary of the system, the desired results of the system, the ability to apply a given set of metrics to the system or some other aspect. The nature of the intervention is always a matter of delicate selection.

Systems practitioners eventually learn that certain leverage points exist in all systems that can be used to initiate change in the system and thus avoid the frustrating effort of attempting to 'muscle" the system into a state of change. Of course the understanding of the existence of leverage points is really just the surface of the problem; the crux of the thing is the identification of the various leverage points in the system and the attempt to have some understanding of the possible unintended consequences of an intervention of that system through the adjustment of the identified leverage points.

Meadows developed taxonomy of systemic intervention points in 1999. Those intervention points are arranged from the one with the smallest overall effect such as changing constants, parameters and numbers (such as subsidies, taxes, standards)to that having the most dramatic effect upon the system; changing the ability to transcend paradigms. As of 2012 this taxonomy had not been subject to empirical validation. During a two year period three different cohousing communities were studied for the purpose of exploring the dynamic of the ethical change. The data collected was analyzed and various themes were developed. Pivotal ethical moments were identified and the leverage point in each change was distinguished and inspected for the effects of its application. This paper discusses systemic leverage points from the perspective of a larger study of ethical change within three cohousing communities that were studied over a two year period. Its purpose is to discover if Meadows taxonomy can be empirically validated as a useful tool to design a process of system intervention to achieve the greatest possible effect, or alternatively the least possible effect upon the system.

The communities that were studied were all located in the Northern California area of the United States and were selected through the process of snowball sampling as were the participants in the study. Data was collected though semi structured interviews and the personal observations of the researcher as well as an analysis of the public presentation of the various communities through their websites. The data that was collected was coded using Atlas.ti and themes developed from that data, in part focusing upon Meadows model.

This paper is divided into an exposition of the various research sites and major pivotal moments within the sites. Those pivotal moments are then examined from the viewpoint of Meadows' twelve leverage points to determine if the data supports that model. Conclusions from the examination are drawn and suggestions for further research are made on.

Keywords: Intervention, Intervention Points, Leverage, Leverage points, Change, Ethics, Systems, Meadows

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UNDERSTANDING FOOD SECURITY NARRATIVES USING GROUNDED THEORY AND SYSTEMS THINKING

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This paper is a contribution to the debate on research methods in which Glaser (1965), Strauss and Corbin (1990 and 2008) and Charmaz (2003 and 2006) approaches and systems thinking approaches are used to engage rural communities with the purpose of studying food security and aid intervention narratives and outcomes. The interviews conducted in the research followed the guidelines set out in the approved application for the Human Research Ethics Committee (HREC) of Central Queensland University as per the National Statement on Ethical Conduct in Human Research of Australia. The paper is based on research (2010-2014) that was conducted in the Dhankuta District of Eastern Region of Nepal. The research combines theoretical constructs from Grounded theory and Systems Theory and applies these within a local context, translating and interpreting individual and community opinion and practice to give emphasis to a local contextualisation and the world view. This research can be categorised as a 'single case with embedded units'. Operationally, this involved looking at interventions in farming practices in two different locations in the case study site of Nepal, where food security issues and changes in farming practice are taking place shaped by international aid. This research uses an ethnographic approach for undertaking of interviews and for organising focus group meetings with the objective of learning through observations of daily life living among the farmers in the community. This was particularly important to establish trust and openness from participants who would provide appropriate information. The use of Nvivo9, a qualitative data analysis tool, was used to generate core categories through the constant comparative method. While the Grounded Theory approach is a complex iterative process, over time such a process leads towards distilled

categories. There are several analytical strategies inherent in forming the categories and making sense or drawing meaning out of the 'emergent theories' such as coding and memoing activities. The codes, concepts and categories developed during the process were used to build the causal loop maps using Simile, a system dynamics software in order to illustrate interrelated factors as well as the feedback. The complex mechanisms within which farm practices operate in the Dhankuta District of Nepal require a methodology that can be holistic and bring about an understanding of the interrelatedness and interconnectedness. It is suggested that a beneficial understanding of food security narratives can be gained by building subjective models of the farming system from the farmers' point of view. This, in turn, could then form the basis of understanding the way of framing development activities to ensure that future farming systems are resilient. It will also address larger issues of food security within Nepal that is rapidly changing. Methodologically, Grounded Theory was found to align with the research tenets and helped identify the emergent themes that contributed towards building a conceptual map of the farmers lived situation. Food security is thus conceptualised in a grounded reality that describes the arrangements that are constituted around the specific Nepalese notion of 'food security'. The building of a causal loop maps strengthens a qualitative system dynamic within a Systems Thinking approach. The combination of Grounded theory and conceptual tools from Systems thinking in this case has been innovative and furthers our collective understandings of cross cultural interventions that seek to improve the situation of less advantaged peoples in rural sector of Nepal.

2271

STUDY ON IT SERVICE MANAGEMENT AT A POLYTECHNIC COLLEGE

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Information systems of higher educational institutes are indispensable to the education and business operations of institutes. Their maintenance activities should keep the systems available even when their circumstances have been changed in education and business operations. Maintenance activities are not usually recognized as IT service; consequently there are few activities intended to improve IT services because the focal point of the improvement of maintenance activities has been cost and budget reduction.

The purpose of the current case study is to clarify the characteristics of the maintenance activities of a polytechnic college from the view point of IT service management. The focal point of the investigation is value-providing IT service for users of the information systems. The ITIL (Information Technology Infrastructure Library), a compiled set of best practices for IT service management, plays an important role for our purpose.

In this study, the tasks of the actual maintenance activities for the information systems at the polytechnic college were classified to know their characteristics as IT service by being compared with the processes described in the ITIL Service Operation, ITIL Service Design, and ITIL Service Transition which are three of the five stages of the ITIL service life cycle. From this classification we identified needs of users, level of performance of information systems required by users, conformity with business strategy, and other factors to provide better IT services for users. We also identified lack of operations in the actual maintenance activities. Based on the identified factors, we finally discussed IT service management of the polytechnic college.

2272

LEADERSHIP ISSUES IN MEDIUM SCALE ACEPHALOUS GROUPS

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Top-down, dominance based organisations are prevalent in today's world. While they may be efficient, the division of people into leaders and followers, or managers and workers, contains an inherent conflict where distrust and antagonism often lead to destructive and even violent organisational dynamics.

As a response to the iniquities inherent in top-down dominance hierarchies some groups form acephalous organisations, where there is no structured leadership. The process of leadership is still necessary, but it manifests in very different ways.

In order to investigate leadership in acephalous groups, we first explore leadership patterns in the animal kingdom with such organisational structures as dominance hierarchies and swarms. We note the links between the interplay of the structurally determined biological make up of the animal with its environment, and the social structure adopted. This forms the foundation for exploring human organisational possibilities. Next, we examine leadership theories, models and concepts that shift the focus from the leader as an individual to viewing leadership as a process resulting from the complex recursive interactions between leaders and followers in a given environment.

Moving beyond the idea of seeing leadership as an interactional process between leader and follower, in acephalous groups, the very distinction between leader and follower is dissolved. Convergence is a medium scale acephalous group in Canterbury, New Zealand formed by a loose network of 300-500 alternative life-stylers and people seeking a break from their usual mainstream life, who come together for a gathering for five days each year. Preliminary research results from interviews and a survey at the most recent Convergence gathering yielded some interesting dynamics within the group's operation and understandings of how it copes with some of the practical challenges of operating acephalously. This research could encourage other organisations to consider an acephalous structure or incorporate some acephalous principles into their operation.

Keywords: complexity leadership, acephalous, relational leadership, complexity leadership theory

2273

CULTIVATION OF PERCEPTION AND CREATIVITY BY REPEATING SOFT SYSTEMS APPROACH

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Employees learn not only expertise on a given problem but also how to solve problems collectively and collaboratively together with others leading to innovation. When they perform innovative activities, they demonstrate collective creativity and perception on the basis of communication. This paper proposes a soft systems approach to cultivate such collective creativity and perception of employees. This approach assumes the use of the soft systems methodology or the design thinking methodology; both consist of the inquiry and learning cycle equipped with the function of double loop learning. An innovation process is viewed as a nexus of self-referential communications by the selectivity of

information. It can be said that the selection is performed unconsciously, based on one's norm, which is the basis of creativity and perception and is born of experiences. It is shown that management of motivation, intellectual curiosity, and spirit of inquiry is required to strengthen one's long-term memory and hence creativity and perception according to results in brain science. In cooperation with such management, rich experiences of innovative activities are required to strengthen creativity and perception, and for the requirement the soft systems approach proposed in this paper plays the role to share rich experiences among employees.

Keywords: Knowledge management, Creativity, Design thinking, Soft systems methodology, Social system theory.

2274

A CRITICAL SYSTEMS PERSPECTIVE ON RESEARCH METHODOLOGY FOR RESEARCH IN E-LEARNING IN INFORMATION SYSTEMS CLASSES

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The aim of this paper is to provide a critical systems thinking perspective on e-learning research in information systems classrooms. Many higher education practitioners are under pressure from their institutions to do research and to publish their findings. Higher education institutions spend large amounts of money on freeing up lecturers' time for research by incorporating better technology in teaching. Many also believe that the so-called generation-Y students can learn only when they are using technology. This leads to three problems: firstly, the class-room becomes a research centre; secondly, average quality research papers are written; and thirdly, technology drives teaching practices and not the other way round. Although these are often viewed as three independent problems they can be addressed as symptoms of one single problem: We struggle to find a method to reflect on and design our teaching practices in a way that truly benefits our students, the information technology industry and the scholarly community we are part of. Overall the motivation for teaching and the motivation for research about teaching become blurred and move away from most lecturers' original motivation for entering academia.

This paper uses critical systems thinking to motivate critical social theory as an appropriate research paradigm and action research as research methodology for research projects in e-learning in information systems classrooms. It reflects on teaching of information systems and using e-learning from a critical systems perspective. Doing research in e-learning in an information systems classroom is viewed as a pluralist-complex problem with some coercive characteristics according to the Flood and Jackson categorisation. Critical social heuristics is used to better understand the different worldviews and associated objectives in the problem situation.

Action research is viewed from the perspective of critical social research therefore the guidelines for critical social research in information systems developed by Myers and Klein are applicable. Key to such an application of action research is the use of a critical theoretical framework or theory to guide intervention as illustrated by the depiction of action research of Peter Checkland. This paper explores suitable educational theories to guide intervention in information systems classrooms what will be beneficial to different groups of interest as identified in the application of critical social heuristics. It aims to address the problems stated above by providing guidelines for good research in the e-learning discipline.

The paper starts with a motivation for the study in section 2. As critical systems thinking is used to understand the problems around e-learning research in information systems, a discussion of critical systems thinking is provided in section 3 focusing on total systems intervention and critical systems heuristics. Section 5 provides a discussion of the problem environment of e-learning research in information systems from a critical systems perspective. Section 5 provides background knowledge on critical social research methodology including action research, both from perspective of Checkland and of Baskerville. Section 6 explores how educational models can be used from a critical perspective as theoretical framework for e-learning projects. The paper concludes with reflections on how e-learning research projects can be done from a critical social theory perspective to be beneficial to all the involved and affected parties.

2276

MEASURING QUALITY IN FAMILY SYSTEMS: THE SCORE INDEX OF FAMILY FUNCTIONING AND CHANGE

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Systemic family therapy has at its core the systems of relationship within each family. Some systemic therapists are interested in how symptoms develop in an attempt to cope with the way the family has operated its relationships. Others are more focused on building the underused capabilities of patients and their families. All believe that healthy family processes will help a designated patient to overcome their difficulties and maintain therapeutic change.

So the ways the family members describe their life at home should be a crucial indicator of the resources the patients have. Until recently there have not been ways of measuring the quality of family interaction either as a research tool for understanding family processes or as a measure of the effectiveness of family therapy.

The development of the SCORE measure of family functioning and its psychometric evaluation are briefly described. Examples are given of the kinds of responses generated by families in therapy and of the experiences reported by therapists for whom the SCORE was often the first outcome measure that they had ever used.

The potential value of a valid measure of family functioning in negotiating with wider Government, health and social agencies is discussed and the results from a pilot study in Germany comparing SCORE results with a standard measure of wellbeing are reported.

Stratton, P., Lask, J., Bland, J., Nowotny, E., Evans, C., Singh, R., Janes, E., & Peppiatt, A. (2014) Validation of the SCORE-15 Index of Family Functioning and Change in detecting therapeutic improvement early in therapy. Journal of Family Therapy. 36: 3-19. doi: 10.1111/1467-6427.12022

2277

A COMPLEMENTARIST APPROACH TO LEAN SYSTEMS MANAGEMENT

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Effective systems management is a desirable, but often lacking, individual and organizational behaviour. An effective management system informs decision making for human, information, technology and machine processes, thus requiring a systemic approach. The consequences for a lack of systems competency are considerable in costs, delays, failures, etc. In this paper, the authors present a complementarist lean systems management approach. As a knowledge engineering approach, it combines the CX tool, Transition-Phase Management model (TPM) and Cascading Failure Model (CFM) methodologies into a meta-methodology to manage lean systems. The CX tool is a system model of both current and desired future states in an organization that aspires to be lean. Based on the Plan-Do-Check-Adjust organizational learning loop, the CX tool provides a means to analyse any current or new system, process or project. The "C" stands for congruence or "equal state" and "X" for all the possible combinations in which the congruence can be developed or improved. TPM provides a mean to manage process change processes; while CFM allows identifying robust process networks. Together they quantify specific gaps to inform continuous improvement. The meta-methodology proposed is a pluralistic approach that integrates all phases of process improvement: diagnosis, solution design, implementation and control while combining social sciences, engineering management and systems engineering disciplines.

Keywords: Lean management systems, CX tool, transition-phase management, resilient systems, knowledge engineering, cascading failure model

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GENERAL SYSTEM THEORY: TOWARDS THE UNIFICATION OF SCIENCE

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This paper questions two core assumptions pervading the field of General Systems Theory (GST) in order to preserve the ideal of the unity of science advocated by its founding fathers. The author claims that an ontology of levels based on unquestioned emergentist and materialist assumptions leads to a disunity of systems. A new metaphysics is proposed that aspires to unify science based on not on logics but on reality in order to transcend four antinomies of thought: freedom, atomism, being and mind. It is claimed that reality is animated by an internal force that permeates the entire universe, an endless craving for being referred as the will. The will manifests in the form of substances imprinting their dialectical character and a plural personality on the universe. Besides the metaphysical law of the unity of opposites, the author postulates a set of ontological laws that regulate the manifestation of substances in the universe: individuation, continuity, linear gradation and recursivity.

In addition, each substance constitutes a different kind of being. Together, constituting the ontological levels of reality that come into being when the substance constituting a

being is dominated by another substance. Furthermore, once substances come into existence in the form of beings, their craving for being is transformed into a will to immortality. However, since beings are constituted by composite substances, this gives rise to an internal conflict between beings because they all have the same hunger for immortality. Fortunately, there is always a dominant substance that provides unity to the composite.

Therefore, beings don't live autonomous or independent lives but interact with other beings constituted by other substances. This explains the interaction between the ontological levels of reality. Moreover, beings display multiple forms of interaction. There are upward, downward, sideward and outward interactions between beings of the same or of a different kind, belonging to the same or to a different unified totalities.

Finally, it is claimed that the will to immortality manifests differently depending on the kind of being resulting in a different forms of individuation. And that a being will only manage to persist in its own being if it preserves its own mode of individuation.

2280

GS2: 'THE UNIVERSE AND ALL ITS PARTS ARE 10DI SUPERORGANISMS'

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The Universe and all its parts, made to the image and likeness of the whole, are ten dimensional Superorganisms.

The substances of those Superorganisms are lineal space=energy and cyclical time=information, 2 dual concepts that express the fundamental duality of the Universe between lineal distances/motions and cyclical clocks/forms. The mind perceives in stillness the moving energy of the vacuum as lines of space=distance – the shortest geometry between two points - and the in-form-ation of the Universe carried in the temporal, cyclical clocks and frequencies, traced by vortices of charges and masses, as spherical particles – the geometry, which stores more information in lesser space. Yet the substances of reality are quantum, lineal forces of energy and cyclical vortices of time, which combine to create the ∞ complementary superorganisms of the Universe, all of them made with spherical particle/heads of information sum of multiple time cycles, fields/limbs of energy that move them & waves/bodies that reproduce the system.

As a result of this duality all systems perform only 2x2 type of dimensional actions: Individually they absorb Energy for its body/limbs (feeding/motion) and Information for its mind; socially they use their surplus of energy to reproduce its form, (ExI) and they gather in herds around networks of energy and information that distribute efficiently those 2 elements, creating bigger whole superorganisms, fitter to survive than the individual 'cell'.

The complex sum of all those time cycles and lineal energy motions give birth to the fundamental 'species' of the Universe, a 10D superorganism, composed of 3 elements - heads/particles of information that guide limbs/fields of energy, and combine in waves/bodies that reproduce the system - which extend through:

-3 local, organic, finite dimensions of spatial energy: length, the direction of limbs/fields in motion; height the location of informative particles/heads; and its re-product-ive product, width.

Those superorganisms grow through their 3 diffeomorphic dimensions, which enact its 3 organic functions in time, with a temporal order given by the dominance and increase of its information from birth to extinction, in a life-death cycle of 3±i ages:

+i: Birth in a lower 'fractal scale of space-time'

- Max. E: Past =youth or 'energy age' of maximal lineal motion.

- E=I: Present=steady state maturity, or age of balance between energy and information when the system iterates its form, creating its clonic offspring that makes the Universe both dynamic and immortal=seemingly unchanged.

- Max.I: Future, 3rd age of information, as energy warps into form (forces into masses & charges) till becoming exhausted.

-i: Death: The system dissolves into its parts, in a big-bang of energy that returns its form back to its cellular scale.

Thus, Universal systems extend through 3 ±i scales of complexity, its i-1 cellular, seminal scale, from where they emerge as individuals to become Relative Fractal, cellular units/points/parts of their bigger i+1 social scale or whole 3x3+i=10 Di superorganism, till death dissolves it back. While from a continuous p.o.v. all those fractal i-scales form a 5th 'classic' Dimension.

Thus all life-death cycles are a journey through 3x3±i relative scales of the 5th dimension; defined by a metric equation, Se x Ti=K, such as smaller scales have more information as its time clocks run faster, but their product remains co-invariant, reason why superorganisms of different scales have the same power and lifespan. I.e. insects perceive 10 times faster than humans but live a maximal of 7 years, which insects will perceive as 7 x 10=70 life years of experience, the humans age.

Thus all superorganisms show 5 isomorphisms: 1) Duality of Energy and Information; 2) Ternary, topological, organisms dimensions of space; 3) 3±i ages and life-death cycle; 4) 4 actions: Max. E, Max. I, Exi, ∑Ex∏I 5) 3 scales of existence. General Systems Sciences (abb.GS2) is the science that studies them.

2284

SYSTEMIC DESIGN FOR APPLYING THE DELEUZIAN CONCEPT OF 'PRAGMATICS' TO EDUCATION AND COMMUNITY PRACTICES

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In this paper, we propose a framework for applying the Deleuzian concept of 'pragmatics' to education and community practices. Our proposed framework draws on the combined use of Deleuze' theory of assemblage and Critical Discourse Analysis (CDA) based on social semiotic Systemic Functional Linguistics (SFL). This paper seeks to appreciate the novelty of Gilles Deleuze's theory of assemblages, and to propose a systemic way to view the process of educational practice and social transformation and change. The dynamic relations of social and interpersonal power as shown in the way that 'micropolitics' of language manifest themselves as a cryptotypic phenomenon.

This paper includes systemic research using a series of action learning programmes illustrating what we call 'process-oriented methodology' in order to address some of the pedagogical issues related to understanding dynamic relation between power and discourse amongst participants in educational and communities practices in Korean contexts.

Keywords: Deleuzian concept of 'pragmatics'; social semiotics; Critical Discourse Analysis; systemic research

2286

SYSTEM BASICS: SYNTHESIZING TRADITIONAL CHINESE MEDICINE AND ENGINEERING THROUGH SYSTEM ENGINEERING

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Traditional Chinese Medicine (TCM) has been servicing and maintaining the health of human bodies for thousands of years. Due to the isolation and control policies of the last two dynasties Ming and Qing, scientific inventions are not being applied to TCM. On the other hand, Western Medicine (WM) has been technologically advanced by the engineering of the industrial revolution age.

Nowadays, many researchers and engineers have tried to advance TCM with modern technologies, for example, medical expert diagnosis system, office automation, herbal ingredient spectrum analysis, modern medical diagnosis machines. However, the merging has not resulted in much advancement in TCM as in WM. The reason, as believed, is that TCM is a holistic diagnosis-cure process while industrial revolution age engineering is reductionism.

It is believed that real advancement could be achieved by the synthesis of TCM with system engineering. Not only that TCM could be advanced, system engineering could also benefit from the experience of thousands of years of holistic servicing and maintaining the human body complex system. This paper searches for the entry point and the platform to learn across boundaries for the synthesis, so that TCM and system engineering could also understand each other and benefit from each other.

TCM is being practiced daily based on the theory of differential diagnosis-cure process. It involves firstly, the awareness, that is, the systemic observation of the human body for information collection. Secondly, the perspectives, which involve the systemic choice of related rules and relationships. Thirdly is the systemic choice of importance, that is, the formulation of weighting of each piece of information and perspectives. Finally is the systemic choice of strategies, for regulation of the self-healing system of the human body to regain the balance. The cycle of these four aggregates would continue to adapt to changes in the environment and the human body system until the healthy objective is achieved. The current state of the human body is represented by three fundamental spectrums, namely, the Superficial-Internal spectrum, the Cold-Hot spectrum and the Deficiency-Excess spectrum, which are believed to have the same origin as set theory. The body can then be divided into five sub-systems namely, liver-wood, heart-fire, spleen-earth, lung-metal, and kidney-water, each system has its own sub-state represented by the same kind of three spectrums.

It is believed that the same diagnosis-cure principals could be applied to either natural or man-made systems. To develop a systemic expert diagnosis system in the perspective of system engineering would help TCM to practically make use of modern information revolution age engineering technology. It would also provide a platform for understanding the holistic view and application of TCM to the natural complex human body system.

Future work would involve the search for possible system engineering projects to be constructed for the other two important theories of TCM.

The theory of holism in TCM is embedded everywhere but usually referred to in the theory of “correspondence between nature and human”, or “human living with the environment”. The coherence is divided into three parts namely, the sky, the earth, and the human, which could correspond to time, space and observer (and decision maker).

Different time of the year, location and people in the environment would provide favorable and unfavorable conditions for different actions.

The third theory for possible entry point is the differentiation and integration properties of the Taichi Yin-Yang system theory and the five elements system theory. This property shows that no matter how many times we differentiate a system into sub-systems, the Taichi Yin-Yang and five elements properties apply. On the other hand, no matter how many times we integrate sub-systems into a single system, the Taichi Yin-Yang and five elements properties also apply. This would facilitate the design, implementation and maintenance of the whole macroscopic-microscopic spectrum of systems.

With all three theories, one fundamental process applies to them all. That is, the continuous balancing of the spectrums in order to achieve the objectives. This same process exists in Confucianism as the “Doctrine of the Mean”, and also in the teaching of Buddha as “The Middle Path”.

Keywords: Supporting Agencies: Ancient Balance Medicine Research and Education Fund Foundation Ltd

2289

TOWARDS THE COMPOSITION OF THE COMMUNITY SYSTEM IN THE POLITICAL PRACTICE OF TOURISM IN THE STATE OF HIDALGO, MEXICO.

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In Mexico, tourism is an activity that generates income, jobs, and the development of infrastructure. However, its importance lies in being a commercial activity prone to be planned in a production system to avoid undesirable impacts on the fields of interest for tourism, comprising the natural, social, and cultural systems. The composition of the participants in decision making is essential because it allows us to know how the resources must be combined to set up tourism activities within the principles of sustainability. In the definition of the players, the government keeps an important role in formulating public policies that affect the design, planning and operation of tourism activities and establishes a communication channel that expands or restricts the scope for action of the other players. Therefore, in this study we propose to define the community tourism system in the tourist practice of politics in the state of Hidalgo from the perspective of systemic with the intention of highlighting the aspects involved in planning this activity. The study identified three orientations and the communal system and its subsystems are presented in the tourism policy.

Keywords: Tourism, complexity, tourist policy, community system.

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ADAPTIVE LEADERSHIP AND SOCIAL MOVEMENTS, APPLYING THE COMPLEX THEORY OF LEADERSHIP

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This paper reviews the configuration today's highly complex social context and how, this vertigo pressed change paradigmatic shifts, which are still undergoing transformations. Visualize and understand the phenomenon of leadership from the perspective of complexity warrants the use of CAS (Complex Adaptive Systems) support by development of complex Leadership Theory (CLT). With this framework it is possible to describe and account for the phenomenon of adaptive leadership that has great similarity with the CAS and how this type of leadership reflects dynamics that characterize emerging social movements.

Keywords: Complex Theory of Leadership, Emerging Properties, CAS, social movements.

2294

THREE DISTINCT US STATE-LEVEL POPULATION DEMOGRAPHICS SHOWN THROUGH A POLITICAL LENS. HOW CAN THIS BE IN A TWO-PARTY SYSTEM? AND, DEMOCRATIC PRINCIPLES APPLY TO ALL, RIGHT?

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Population health studies, at state level, have shown that when the US is regarded as a homogeneous population (i.e. a single population from a systems perspective) a negative relationship is seen between income inequality and health; in general the greater state inequality the poorer its health.

However, since the 1968 Presidential Election the Republic has increasingly become politically polarized into Red (R - Republican) and Blue (B - Democrat) states, creating a unique opportunity to examine population health through a political lens. This more discriminating lens reveals that a far more complex, nuanced and compelling system is in operation. The studies reveal three distinct state-level populations differentiated by political affiliation and historical/geographical considerations; Blue states (B) and two populations of Red states (RI and RII), where RII is comprised of the states that seceded from the Union in 1860 plus the key border state of Kentucky.

The Federal data sources used throughout the study reveals, in each of the health parameters examined (Life Expectancy, Infant Mortality, Child Mortality, Low Birth Weight, and Pre-term Birth), a consistent health gradient with B>RI>RII, (where > indicates better than). Further, using the political lens, the state level inter-relationships between life expectancy, poverty, income, high school graduation rates, K-12 funding, and race will be presented and examined. In each of these inter-relationships, again the data consistently depicts the gradient B>RI>RII.

Race shows itself to be unique among the parameters examined. While racial differences between the three populations follow the gradient B>RI>RII there are striking similarities exhibited in each populations. For example the ratio of Black/White high school graduation for each population is remarkable consistent. It is postulated that different social/political pressures are exerted within populations that result in the

differences between them, while at the national level the exerted pressure is uniform so as to produce similar effects in each of the three populations.

The data presented illustrates a complex inter-related system. But more so it begs a much larger responsive social question; is there an overarching system that provides the major influence on the multitude of systems within its purview, which produces positive or negative outcomes for individuals based on their birth state? Furthermore, does such a system exist and if it does is there a SIG for it?

Keywords: US Population Health, Political Lens, Three Distinct Populations

2295

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Part 2: The four pillars of democracy (freedom, equity, representation and justice) have eroded. Who stole the dream? Was it an illusion or a simple case of bait and switch?

The democratic principles upon which the United States of America was founded consist of the four essential pillars of freedom, equity, representation and justice. Every American is taught this. Growing up in Wisconsin I understood this but I also knew, for reasons that were unclear to me, that I was grateful to have been born and raised in a northern state as opposed to the South. At a young age, the seeds of an omnipresent, poignant question were sown, “Aren’t these four pillars and our democratic principles a promise for all Americans?”

Fast forward to July 2014. My current pondering about this compelling question has revealed an undeniable, significant and fundamental disconnect between the democratic dream that we study and the democratic reality with which we live every day.

I’m despondent, as every American should be. Why?

Our freedom is chipped away at every day - the NSA is monitoring my cell phone conversations.

We aren’t equal nor do we pretend to be - 1% of Americans own at least 35% of the wealth.

Our elected representatives vote in concert primarily with and for the top 10% of the wealthiest citizens’ and/or businesses’ interests, rather than with the remaining 40% of us that make up the middle class.

People of color continue to disproportionately face arrest, imprisonment, and the death penalty – in spite of the fact that we’re horrified that Jim Crow laws were ever part of our history?

This last point brings me full-circle, back to my childhood-felt gratitude for having been born in the north. Why is there such a vast difference in the opportunity to attain the democratic dream between the north and south? There are books being published quicker than we can read them that contribute a particular perspective on the uneven application of the democratic pillars; Capital, Dog Whistle Politics, The New Jim Crow, Divide, Polarized America, Aftershock, to name a few.

The results from the grand experiment known as American democracy are mixed. There is an evaluation afoot from diverse sectors examining the extent to which democracy exists in America. This presentation and ensuing discussion is an extension of that evaluation from the unique and potentially powerful perspective of systems sciences.

How does theory materialize into practice and produce tangible results and when do systems sciences bring that about? Does ISSS want to bring positive change to societal inequity and if so how will it go about it?

2298

TIME DISTORTION AS A METRIC FOR INFORMATION AND ECONOMY IN ORGANIZATIONAL CONTROL

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Organizational management systems, for control and command, have attracted a great amount of research and debate since the very origin of management, as its underlying question is: how to manage human activity systems successfully? More recently, the so-called 'Balanced Score Card' approach has assumed dominance in managers' practice. While that approach has its merits, it also has some important limitations; among others it ignores the concept of time and its relation to information. To deal with some aspect of this limitation, this paper introduces a metric, (e.g. mathematical model) based upon information theory (entropy). The entropy in this paper measures the information content of time distortion in organizational performance and links it to the economic outcome (profit). The paper demonstrates how time-based goals can serve as a metrics of both information and economy, and that the relation between information content and economy outcome is not linear. The paper suggests a mathematical model in which the management system and its operating system are carriers of information (as measured in nats) with economic dependence. The proposed model shows, among others, that time-distortion influences economic performance dramatically, including a lever effect, while high information entropy does not necessarily imply high economic outcome. The outcomes of the paper are contra-intuitive and may suggest a new metric for assessing goal oriented information from management system to its operating system. It may also be seen as a model for assessment of management efficiency with respect to time and economy.

2299

CONSILIENCE LEADERSHIP IN THE EDGE OF CHAOS

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The edge of chaos is to balance the edge between periodic and chaotic behavior with instability of order. There are three main scenarios in the edge of chaos. First, Desilience (Disintegration- a “Challenging” or worst case future). Second, Resilience (Recovery- an “Aspirational, Visionary” future) and the third is Consilience (Enlightenment- an “Audaciously Aspirational” future).

There will be a description of 15 different types of leadership by Using NEtS (human dynamic personality analysis) to reset different types of leadership into the three main scenarios in the edge of chaos.

To conclude, different types of leadership will be chosen to fit into the scenarios of consilience. These types of leadership will be categorized as consilience leadership.

In academia, “consilience” is literally knowledge seamed by the linkage of facts and fact-based theory across interdisciplinary disciplines to construct a common groundwork for explanation. This refers to the creation of a new field of study that integrates the world of humanities with natural science. In essence, consilience leadership is of significance by

using transdisciplinary interaction to lead and leap into the "Audaciously Aspirational" future in the edge of chaos.

Keywords: edge of chaos, scenarios, consilience leadership, transdisciplinary interaction

2300

UNDERSTANDING SYSTEMS THINKING: MOVING FROM CATEGORIES TO COMPETENCIES

Pamela Buckle Henning

It's often said that some people just have a "systems thinking personality"… or, they don't. What's being attempted in a statement like this is a classification of who is a "systems person" by the category of personality they belong in. Since ancient times, humans have sought to classify people by their personalities. One of the most influential theories of personality in contemporary times was developed by Carl Jung, an analytical psychologist from Switzerland, who published his book Psychologische Typen in 1921. Just as some believe "systems people" are different from those who are not "systems people" by dint of their personalities, Jung originally viewed personality in a similar way. Grieving the loss of his friendship and collaboration with Sigmund Freud, Jung sought to answer this question: why were he and Freud so different? This research question – posed this way, resulted in Jung's conception of human personality in terms of dichotomous pairings. Thus, his theory posited that individuals are oriented inwardly or outwardly (he termed these introversion and extroversion); they take in information by perceptual processes drawing on the sense organs or unconscious information (he termed these processes sensing or intuiting); and they make judgments based on intellectual cognition or subjectively-held values (he termed these psychological functions thinking or feeling).

Later in his career, Jung's clinical experience (and no doubt his recovery from the pain of his break with Freud) caused him to revisit his view that personality was dichotomously organized – rather than mutually exclusive categories, he began to see eight dimensions of personality (four modes of perceiving: introverted sensing, extroverted sensing, introverted intuiting, extroverted intuiting – and four modes of decision-making: introverted thinking, extroverted thinking, introverted feeling, extroverted feeling). He came to view personality as a system of traits that interacted within each person's psyche in unique ways. Given this shift, rather than a theory designed to understand how people are alike or different – i.e. what category their personality puts them in (and what category it keeps them out of!), Jung's theory of psychological type can now be utilized as a more highly-detailed examination of the ways individuals' orientations, perceptual processes, and judgment styles govern their conscious and unconscious functioning. More particularly, for our interests here, Jung's psychological type theory can help us more clearly understand the ways individuals' orientations, perceptual processes, and judgment styles govern the ways they approach systems thinking.

For instance, we can begin to examine human orientation – toward introversion and extroversion – for how each influences the way one engages in systemic phenomena, as researchers or otherwise. We can compare and contrast the four ways of perceiving identified by Jung, seeking to understand how each effects the kinds of systemic phenomena we are likely to notice, whether we see them as operating separate from us or involving us. We can study the four modes of decision-making Jung identified, as key factors in how each of us determine what data sources we're going to find most

compelling, what systems methodologies we find most convincing, whose views on systems work we respect the most.

The question of "What distinguishes a systems thinker from someone who isn't?" is a question much like Jung's attempt to understand "How are Freud and I different?" – a question born of the antagonism that grew between them, a question that generated his personality theory. But the theory it generated has a value far greater to us than a way to explain why systems thinkers find themselves in a category apart from others (who we tend to believe undervalue or misunderstand our category because they're not in it!). Rather, a more pressing need the systems community faces is to understand what human capacities are involved in systems thinking so we can understand it in its own right, rather than understanding it to explain feelings of alienation from the larger community.

Jung's theory of personality type identified an array of human capacities – many of which may be as-yet unidentified, vitally-important systems thinking competencies. What lies before us now is the task of identifying and measuring the specific human capacities that makes someone a systems thinker – in effect, how some people use their psychology to discern and work with systemic phenomena.

2302

TOWARDS A SERVICE ECOLOGY APPROACH TO IMPROVE SOCIAL SERVICE UPTAKE AND OUTCOMES FOR 'HARD TO REACH' POPULATIONS

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This paper outlines a research project that tackles the question of how social services can effectively engage with populations considered 'hard to reach'. Ensuring service uptake and outcomes for the 'hard to reach' is a vexing issue facing New Zealand social policy makers and social service providers. We draw on the service science and systems thinking concepts and methodologies to analyse social service-client engagement as the result of interactions between critical actors and resources including those for whom services are intended. By mapping the critical actors, their resources and what matters to them the project aims to develop an understanding of how service engagement and uptake is mediated by the service ecology and enhanced by the motivation, knowledge and resources held by families/communities regarded as 'hard to reach'.

This paper considers the debate around what might constitute a 'hard to reach' population then describes the project methodology which is case study based and centred around three social service providers who work with high-risk families. We explain how we work with these social services to account for the complex ways in which the motivation, knowledge and resources held by families/communities, service configuration and service provider ecology interact to create opportunities and barriers for engagement. Some initial findings are presented. These lay the foundation for the development of a generalizable model of how social services can engage with the 'hard to reach' to enable an evidence-based approach to service design, implementation and evaluation. This paper concludes by reflecting on some of the theoretical and methodological considerations that have informed the work to date.

2303

KNOWING DIFFERENTLY IN SYSTEMIC INTERVENTION

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This paper makes the case for extended ways of knowing in systemic intervention. It argues that the deployment of formal (even reflective) thinking and dialogic methods are inadequate to the two critical tasks of comprehending larger wholes, and appreciating others' viewpoints. Theory and techniques need to go further and access other forms of knowing, held in experiential, practical or symbolic ways. This could offer a better basis to incorporate marginalized people and things that are affected by the intervention but do not have a voice, such as ecosystems and future generations.

Keywords: Systemic intervention, systems philosophy, ways of knowing, boundary critique, critical systems thinking.

2307

SYSTEMS THINKING FOR STRENGTHENING NATIONAL COMPETITIVENESS IN SOUTH KOREA

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This paper is not a research study but rather a preliminary framework constructed with regard to the problem noted in the title of the paper. In order to strengthen South Korean economic competitiveness, major components of the economic system need to depend on systems thinking. In the globalized period, they need the unified identity of global citizenship. And they should obtain a comparative advantage from every interaction with their own of other nations. Their comparative advantage, in terms of co-evolution, ultimately is based on global citizenship as the evolution of universal citizenship.

P.B. Checkland says that system thinking is founded upon two pairs of ideas: those of emergence and hierarchy, and communication and control (Checkland 31). Systems Thinking is utilizing modal elements to consider the componential, relational, contextual, and dynamic elements of the system of interest (Davidz). Between the components of the system there is a hierarchy, at the same time that there is a mutual relationship. In this paper, systems thinking is presented as a pair of concepts: systematic and systemic. Systematic thinking means using a method, or following a plan or an explicit and rational procedure. Systemic thinking means using systems ideas, treating things as systems or from a systems viewpoint and pertaining to a system or systems.

The World Economic Forum's detailed global competitiveness index with regard to South Korea is presented on page 221 of The Global Competitiveness Report 2012–2013. The report indicates that, reversing the negative trend of recent years, the Republic of Korea has advanced five positions and re-entered the top 20, at the 19th position. South Korea can boast an outstanding infrastructure (9th) and a sound macroeconomic environment (10th), with a government budget surplus above 2 percent of GDP and a low level of public indebtedness. Other high quality factors, notably universal primary education (11th) and higher education (17th), combine with the country's high degree of technological readiness (18th) to partly explain the country's remarkable capacity for innovation (16th). But it is reported that three concerns persist—namely, the quality of its institutions (62nd), its labor market efficiency (73rd), and its financial market development (71th), even though Korea has posted improvements in all three areas. In

the future, South Korea may try to have much more comparative advantage than other countries.

Keywords: system thinking, co-evolution, comparative advantage, global citizenship

2316

EXPLORING CHANGES IN TASK COMPLEXITY AWARENESS WHEN A GROUP OF STAKEHOLDERS WORKED ON A COMPLEX ISSUE OF CONCERN

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The focus of this paper centres on the implications of a facilitation intervention, when a group of stakeholders in Sweden used a developmentally-designed, structured group process. The stakeholders consisted of personnel from the ambulance service, SOS alarm, AmbuAlarm, and the police. The objective was to improve stakeholder communication when dealing with incidents where an assembly point is deemed necessary to reduce risks of violence for ambulance staff, while still needing to rapidly attend to citizens who are unwell. The research study explores how the facilitated structured issue analysis, based on complexity theory, impacted the stakeholders' reasoning about the issue of concern, as well as optimal solutions, before and after participation. The stakeholders met multiple times, and individual interviews were conducted before and after group participation. By offering a set of structured steps that helped to scaffold the participants' interaction, the group reached a different understanding of the complexity of their issue. The process resulted in a reformulation of the original problem description and unanticipated action strategies. In the analysis and discussion I outline how these new strategies were formulated at a higher level of task complexity awareness, by drawing on theories, conceptual frameworks and models developed on the basis of empirical research on adult development.

2317

DESIGNING LEARNING SYSTEMS? EXPLORING CRITICAL SYSTEMS PHILOSOPHY FOR THE DESIGN OF LEARNING ACTIVITIES FOR STUDENT SUCCESS AND SATISFACTION.

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Pedagogical activities that contribute to learning and academic success are often informed by good ideas that motivate and inspire students. These ideas are consciously or unconsciously informed by notions of teaching and learning that are aligned with theoretical tenets. Systems thinking scholars have explored some of these ideas when considering how various aspects of systems thinking are taught and learnt. However, these conceptual and philosophical ideas require translation into practical designs that are available to systems practitioners and academics for implementation. In this paper, we firstly surface the assumptions and theoretical tenets that underpin the teaching in a postgraduate management course. These theoretical tenets are presented as three related ideas that constitute an educational philosophy that primarily draws on variation, complexity and critical systems theory. Secondly, we explain how such an educational philosophy informs the pedagogical design for learning causal loop diagrams in this course. Finally, preliminary results of students' experience of the pedagogical design for learning casual loop diagrams for modelling management problems are reported upon.

Keywords: Pedagogy; critical systems theory; causal loop diagrams; postgraduate management course.

2320

VALIDATING MODELS IN PUBLIC HEALTH RESEARCH

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The application of systems method to the understanding of public health problems (e.g., alcohol and drug abuse, chronic disease, obesity, tobacco use, and violence) has grown considerably in the past decade. System methods are seen by many of their advocates within public health as complimenting traditional behavioral and epidemiological research methods, while others see them as a fundamentally different way of understanding and explaining public health problems. Those who see the methods as complimentary often use empirical data from studies employing traditional methods and statistical analysis to validate the output of simulation models. As in other fields of applied research in which modeling has become popular, this tendency to equate a model's correspondence to data with the model corresponding to reality is especially pronounced when the goal of the modeling is to inform public policy. The present paper discusses the problems that arise when using data from an empirical study to assess the validity of a simulation model. It illustrates these problems through an examination of a specific example from the public health literature. The example demonstrates that, rather than empirical data being superior to the model, each is better considered as simply capturing a different aspect of a real-world system. Alternative means of assessing model usefulness are also discussed.

Keywords: Model validation, system simulation, public health.

2321

THE BOUNDARY TRIAGE: A SYSTEMIC LEADERSHIP TOOL

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We live in an increasingly digitally networked world, with increasing complexity and uncertainty. Digital technologies offer the opportunities for innovation, knowledge management information gathering and analysis that have the potential to provide a community or organisation's leading edge by harnessing human capital within and without the organisation.

The digitally connected organisation has been coined the 'boundaryless' organisation, blurring both the vertical and horizontal boundaries of the organisation, seeing supply chains and organisation silos deconstructed. As new work practises and forms of organisation emerge, business leaders have to balance organisation and stability, with innovation, growth and market uncertainty. This technological 'boundary-less' environment reveals that we are in an increasingly 'bounded' world. Business leaders have to become competent 'boundary spanners' as they move from 'command and control' to 'connect and collaborate', enabling and encouraging participation and leadership at all levels. Yet this requires a new set of leadership skills, a 'new' way of thinking that has yet to be found that can deal with complexity in a sophisticated way, focussing on just a few key elements. My MBA research (2011) revealed that the

adoption, implementation and success of social technologies for open innovation and collective intelligence were dependent on leaders' personal boundary judgements toward social technologies.

This paper introduces the Boundary Triage, a symbolic representation of the partial ontology of the Boundary concept that I abstracted from a transdisciplinary review of technology, innovation and leadership literature. The Boundary Triage aims to provide a theoretically grounded, easily understandable and deployable a systemic leadership development tool based on systems thinking to non-systems practitioners. The 'Boundary Triage' is still in its infancy and needs to be tested and developed further. In line with Maturana's (1980) approach to coining the term 'autopoiesis', which was initially advanced as a proposition to be tested, by calling the partial ontology of Boundary the Boundary Triage it will have the freedom to be tested, explored and developed both as theory and as a practical tool.

The partial ontology of Boundary proposes that a single Boundary is socially constructed and reinforced by environmental, physical, psychological, and physiological factors. Represented by the Boundary Triage, a Boundary consists of the interactions of a Creator (C), Acceptor(s) (A) and Reinforcing Factors (RF) that have an emergent effect on the Boundary. Two further concepts are to be used with the Boundary Triage: the Bounded Event (BE): the moment/time a Boundary is conceived, and the Bounded Object (BO): what is taken away from the BE moment and carried as a memory, belief, worldview or paradigm.

In practise, the Boundary Triage as an immediate 'triage' when a boundary has been 'crossed' in a social context recognised either by language, gesture, feeling or atmosphere and quickly prioritizing the RF of the Observer and the Observed, and aiming to adjust them psychologically and through dialogue. As a personal heuristic, the Boundary Triage is also used by a leader to reflect on the 'what', 'why', 'where' and 'who' (BE) that created the BO causing the 'mess', critique the BO and review personal worldviews and paradigms. Informal empirical examples by individuals to date have reported improved performance, better communication and more self-awareness but the role of values and ethics is still to be determined.

The Boundary Triage is purposely simple for the non-systems practitioner, but it is partial and needs to be developed further. Fieldwork is currently being conducted to develop the Boundary Triage as a viable systemic leadership tool.

2322

A MACHIAN PERSPECTIVE ON THE SYSTEMS APPROACH

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The paper discusses two related questions: where to 'cut' system definitions and systemic relations based on the perspective of the involved stakeholders. Both are historically related to the genetic historical /-critical, monist approach of psychophysicist Ernst Mach.

Ernst Mach transferred the then current Darwinian evolutionary conception to the epistemological discussion of the historical development of procedures and theories with implications for their 'epistemological' value. Scientists' statements on the nature of reality need to be based on observations, which require an analysis of the 'psychological worldview' in and from which observations are identified, measured, analyzed and interpreted. The worldview of scientists influences observations, interpretations of observed facts and identification of causality in models of reality. In turn, observations

lead to adaptations of the thought structure (in terms of models and causality) of scientists as much as to a selection of observations that are deemed legitimate to support or refute a hypothesis. At some point, this process necessarily involves a 'cut' of relations considered and analyzed. This issue is reflected in the work of Herbert Simon on system decomposition and and aggregation.

For the analysis of (causal) interactions in complex systems (Auyang 1998), Simon and Ando (Ando and Simon 1961, see also Shpak et al. 2004) have developed the concept of (near) decomposability, based on the notion that the interactions in structured systems can be separated into groups of interactions according to the strength of interactions between elements of a system. Groups of elements (variables) among which interactions are much stronger than among other elements, are separated into specific 'modules' separate from elements with less strong interactions. It is assumed that most of these inter-group interactions can be neglected and intra-group interactions aggregated into single variables.

The obvious danger in this assumption is that interactions between groups of variables can be neglected respectively that microstate variables can be aggregated into macro-state variables over a number of conditions and / or for longer time horizons. This assumption may be correct in the short run or under normal conditions, but may also be wrong under longer terms and more unusual conditions. Thus from a 'complexity / non-linear mathematics perspective 'small' effects may lead under positive feedback to the crossing of thresholds and phase transitions and then may be observed as increased stress, risk and catastrophes in a system's development (cp. Thom 1989, Jain and Krishna 2002, Sornette 2003).

In human systems these aggregations in the form of system definitions and system models involve approximations and hypotheses on system behavior in the mental world of actors. These assumptions underlying mental representations of systems are likely to be proven wrong earlier or later with the further development of a (dynamic) theoretical system.

In order to tackle the question of where to 'cut' system definition, decomposition and system aggregation, the paper proposes to employ physicist-psychologist-philosopher Ernst Mach's genetic perspective on the evolution of knowledge based on his research in the history of science (Mach 1888, 1905, 1883). Mach suggests to replace causality with functional relations, which describe the relationship between the elements of the measured item and the standard of measurement (Mach 1905, Heidelberger 2010) as functional dependencies of one appearance on the other. Measurement, system delineation and aggregation is thus based on the tools and perspective or worldview of scientists. The paper sketches the links between Bertalanffy's and Mach's non-positivist approaches and Simon's formal approach to derive requirements for 'tools' to converse about system definition, decomposition, and aggregation (modularization) interrelated with and dependent on scientists worldviews.

2325

THE SM SYSTEMS PARADIGM: A PARADIGM, PATTERN, REFERENCE MODEL, META-MODEL, AND HOLON FOR "UNIFYING" THE SYSTEMS DISCIPLINES, CREATING A GENERAL SYSTEMS THEORY, AND SYSTEMS PRAXIS

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This paper presents the DSM systems paradigm -- its' elements, inter-relations, characteristics and foundations. It may be described as: a fundamental repeating pattern that may be found within and between all fields of systems inquiry, a holon that spans multiple scales and levels of systems hierarchy, a model and meta-model for systems praxis covering both systems theory and application of theory, a fundamental element / node in networks of systems, and may be considered a fundamental philosophical and theoretical framework for "unifying" the concepts, principles, theories and generalizations of the systems disciplines and in the on-going creation of General Systems Theory.

The DSM systems paradigm is grounded in many disciplines such as Semiotics (syntax, semantics, pragmatics: the theory of signs and signification), Ontology, Knowledge, Schema Theory, Perception, theories of Anticipation, Action and Activity, Reasoning, Learning, Meaning formal languages (e. g. Logic, Category Theory), Social Theory, and the system sciences such as General Systems Theory, Complexity Theory, Complex Adaptive Systems, and First and Second Order Cybernetics. This paper will first discuss this grounding at a conceptual level and illustrate how this grounding "binds" the elements of the paradigm and their repeating patterns, forming the foundation for a "meta-theory" for General Systems Theory and subsequently forming the basis for systems praxis. As a consequence, two fundamental problems in General Systems Theory will be addressed: semantic gaps between disciplines and semiotic gaps in world-views.

From this grounding, the paper will explore the application of this paradigm to issues in General Systems Theory found in a number of diverse situations, systems, practices, and domains. For example, the identification and characterization of isomorphies, the identification of system elements that may be isomorphic between systems, processes of self-organization, and problem identification, characterization and framing. It will be noted that the paradigm itself is transdisciplinary in nature, and in turn enables and supports transdisciplinary inquiry into General Systems Theory, systems praxis, and problem solving within and between any system(s) of interest.

2327

SYSTEMIC INNOVATION – THEORETICAL CONSIDERATIONS

Erik Lindhult, Gerald Midgley

Innovation is a topic which has, during recent years, received increasing interest, not only in the area of business development, but also in relation to performance in the public sector and dealing with pressing social and sustainability issues. The still young field of innovation management has in some ways already drawn upon or emulated insights from systems science; e.g., in understanding national and regional innovation systems which support the creation of novelties by interacting agents and institutional elements (Lundvall, et al, 1992). Innovation is commonly defined as the development and diffusion of something new. It is new ideas realized in use (van de Ven et al., 1999, Tidd & Bessant, 2013).

However, the concept of systemic innovation is not yet well defined. One reason is a rather “unsystemic”, objectified and linear understanding of innovation and its management, where innovation activity is aimed at developing innovative objects – products or services - to be put to use and diffused in social contexts. In the innovation field, ‘systems’ are often seen as the objects to be innovated, or tools (e.g., information systems) which help facilitate innovation. But this is not primarily what we mean by systemic innovation. As a general definition, we see systemic innovation, not as the production of innovative objects, but as shifts in system structures, dynamics, communications, foci of attention and ways of thinking leading to enhanced or different purposes and performances. The latter may not only have commercial benefits but also social and environmental ones, and systemic innovation points to the need to see leadership and management as capabilities and activities that are integral to systemic context (Goldstein, Hazy & Lichtenstein, 2010). The purpose of this paper is to clarify systemic innovation as a concept, and through it open up new ways of understanding, theorizing and managing innovation, as well as to point to the potential for applying existing systems theory and practices in the field of innovation. The concept has only been in quite limited use so far (Teece, 1988, de Laat, 1999, Jaspers, 2009, Johannessen, 2013) and is fruitfully employed for the analysis of situations where innovation cannot or should not be objectified into the creation of innovative objects or products, but needs to involve broader changes in relationships and contexts, like the organization of innovation and service systems; transitioning to sustainability; and social and community development. It can support theorizing of the more interactive, network oriented, and ecological perspectives on innovation processes winning ground today.

In order to clarify systemic innovation, we employ conceptual resources from the systems science tradition, acknowledging that there are multiple (sometimes conflicting) understandings and uses of terms like ‘systems science’, ‘systems thinking’, ‘management systems’ and ‘systems methodology’ (Midgley, 2003). We embrace theoretical and methodological pluralism on the grounds that no one systems approach can make a credible claim to comprehensive understanding (Flood and Jackson, 1991; Gregory, 1992; Midgley, 2000). In order to clarify systemicity we use a recent synthetic attempt to consolidate the field into four ‘systems thinking skills’ (Cabrera, 2006, Cabrera, et al, 2008a,b). The four skills are said to be ‘making distinctions’ (i.e., drawing boundaries); ‘exploring interactions’; ‘appreciating multiple perspectives’; and ‘understanding phenomena as whole systems’. Each of these systems thinking skills, when exercised in practice, may change people’s understandings and hence their actions. However, while Cabrera et al (2008b) have methods to support the teaching of systems thinking skills, they stay largely silent on the various systems methodologies and methods that have been developed for intervening in organizations (Midgley, 2008). We observe that each of the latter tend to be pivoted around just one of these four systems thinking skills, with the other three harnessed in a subsidiary role. Thus, different systems methodologies and methods can be used to support the practice of different systems thinking skills, and Cabrera’s framework can help organise our understanding of systems methodologies and their associated methods. Systemic innovation can therefore be clarified as the application of systemic thinking, with systems methods employed in a supporting role, to produce enhanced or new purposes and performances. The result is the development of a conceptual model of systemic innovation proposed as useful for theorizing innovation and innovation management in new ways, as well as providing a point of departure for building a truly systemic theory of innovation.

Keywords: innovation; systems thinking; systemic innovation

2328

EXPLORING ORGANIZATIONAL PROPRIOPERCEPTIO

Allenna Leonard

It is common to look for analogies between individual humans and their collective enterprises such as organizations on many dimensions. One of the most fruitful is to explore what helps them to survive and prosper at the unconscious as well as the unconscious levels. The sense of proprioperception orients our bodies as they move through space and time; with information from numerous receptors providing continuous feedback so that for the most part we do not have to think about it.

In the individual, proprioperception remains mostly unconscious unless there is a problem or a need is felt to adapt, extend, maintain or repair the facility for intentional motion. Sometimes acclimation or practice is all that is needed such as when people get their 'sea legs' during the course of a journey and stop feeling seasick. This is essentially adaptation although supplementary strategies and medication may be employed. But it may become conscious in individuals after an injury. Physiotherapy and sports medicine often focus on balance exercises as a way to return the body to its pre-injury level of functioning. Even when there is no injury, people may focus on balance exercises in order to prevent one from occurring, especially if they are getting older or wish to take up an activity that will require more from their sense of balance than their everyday routines. In less ordinary circumstances, individuals work on building up their proprioperceptive senses in order to pursue sports or performance at a high levels. Finally, mental as well as physical well-being may be enhanced by the practice of tai chi and other moving meditations that enhance awareness of our body's ongoing dialogue with gravity. The sense of individual balance may also be observed in social settings when new circumstances and new settings call for a different dynamic.

When it comes to organizations, a sense of balance is implicit in the many homeostats that operate as part of tacit knowledge and other informal as well as some formal habits of behavior. Like individuals, organizations may need to adapt to changed rhythms, recover from injury, stay limber to maintain capacities or extend their activities into new areas. A new management style may create dissonance; the market or the customer base may change or other factors may lower morale. That, of course, is assuming a positive organizational atmosphere to begin with – and probably is another argument for corporate ethics and responsibility. The individual usually has less potential difficulty than the collective as the parts of the body know they are one and depend on one another. The Viable System Model's major homeostats and Appreciative Enquiry will be discussed as a means of addressing the potential for exploring and nurturing organizational proprioperception.

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INTERDISCIPLINARITY MODEL FOR MANAGEMENT EDUCATION DESIGN BY SOFT SYSTEM METHODOLOGY

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Soft System Methodology (SSM) consists on a helpful systemic tool for understanding complex and problem situations. It does not intend to generate solutions for such problems, but rather to advance in exploitation. Actions are not forced but rather constructed through consideration of the whole problem by its means and its different consequences that could arise from a deeper analysis. SSM by Peter Checkland (1981) promotes a path to the solution of conflict situations by deep thought about its origins and implications, allowing a systemic approach in its complexity. This methodology offers answers to the dangerous current difference between a complex reality and simple linear thought in terms of how to act within such complexity. Traditional methodologies deal with hard problems, which means those problems that can be measured and defined and whose results are quantifiable (LIBONI; CEZARINO: MARTINELLI, 2006).

When considering management education models there is an assortment of different critics about. Problems can be described as distance between management theory and practice, lack of interdisciplinarity for management solutions and a fragmented concepts presentation that management student is submitted. In other words the traditional way of teaching management creates a soft problem that linear methodologies cannot deal.

This paper aims to propose an Interdisciplinarity Design Model for Management Education. By developing the seven steps and the transition between systemic and real world, it was possible to design a systemic model for management education.

The management model designed by SSM shows three major dimensions: curriculum structure, organisation and didactics. The real actions that arise from analysis are the teaching process beginning by presentation of organisational problems, student-centred techniques, market demanded competences creation and establishment of proximity between content of different disciplines.

For final considerations the SSM was effective to construct a new way of understanding and analysing management education. It has considered the main problems related by the obscure meanings and process involved, offering new possibilities of solution.

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AN EVOLUTIONARY FRAMEWORK FOR GLOBAL SUSTAINABILITY EDUCATION: AN INTEGRAL POSTHUMAN PERSPECTIVE

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This article offers a perspective for disciplined inquiry into the proposition that a sustainable 21st century global community is attainable, but urgently requires intervention by civil society to transform our major educational systems via consciously-guided evolutionary learning. As an affirmative framework for global citizenship, evolutionary learning invites expanded visions of humanity and enables healthy societal development through the emergence of human-ecological syntony. The envisioned framework for educational change would lead to engaged learning that develops the human capacities for values-based inquiry across the full spectrum of socially organized and technologically-mediated human activities, while supporting the emergence of human culture that embodies the stability, generativity and resilience of healthy natural systems.

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SCIENCE & SPIRITUALITY

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Memory,Values, Light, Akasha, Love, Peace

How to consolidate all my experiences, and how can I explain it to make it yours?

Since I was a child I went through several unique experiences that I could only start to understand a few years back:

-The experience of being dead for a short while.

-The experience of being one with nature.

-The experience of meditation in many ways: Tao, Vipassana, Raja Yoga, Tracendental, Tantra,…

-The experience of seeing a person in front of you that you feel is another you, you can see yourself on him/her.

-The experience when you lose yourself in running.

-The experience of Self-help group energy that gives answers.

-The experience of this feeling deep inside my gut, that happened at the same moment a loved one died.

-The experience of communicating with loved ones at the same time in different parts of the world.

-The experience listening binaural and isochronic bits with a certain rhythm.

-The experience of feeling pure and fluent “LOVE”.

And many more experiences, which have been a lot. And the more I have the more I realize that everything goes to the same end: “ONENESS”, WE ARE ALL ONE.

This project is about connecting Science and Spirituality. Although we still can’t explain everything about spirituality in a scientific way. Year after year we have more and more scientific answers for the spiritual phenomena. And not having still all of the answers, doesn’t mean that it doesn’t exist.

We already know that “everything has to do with everything”, and everything is a subsystem of another bigger subsystem, and so on. All of them with the same properties, in the microcosm and the macrocosm.

We have contributions of several fields in this holistic approach of interdisciplinary nature of the group.

To show some aspects of this, I would like to introduce you six people and myself. We all come from different backgrounds and different disciplines:

1- Viviana Ruth Koldorff presents "Decoding of Cellular Memmory".

2- Ernesto Van Peborgh presents "New Paradigm of the IT Networks".

3- Christian Plebst presents "Wired Love".

4- Peter Straubinger presents “In the beginning there was light“, Breatharianism and the look across the boundaries of science.

5- Ervin Laszlo presents "The Akasha Paradigm in Science and Human Consciousness".

6- Fabiana Crespo presents "Pure Love Experience".

7- Masaru Emoto "Emoto's Water Peace Project".

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PHILOSOPHICAL ORIENTATIONS: ISSS FOUNDING FATHERS/MOTHERS

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Building on my research into the history of the ISSS and the work of the five founding "fathers" - Ludwig von Bertalanffy, Kenneth Boulding, Ralph Gerard, James G. Miller and Anatol Rapoport - this paper will provide an overview of the philosophical underpinnings of their individual and collective work in nurturing inter- and trans- disciplinary research into the nature and function of complex systems. Since Margaret Mead is also included as one of the founding members of the society, although she was not actively involved in the initial formation of the society, the paper will touch briefly on her contribution to the evolution of systems philosophy. The commonalities and differences among the various perspectives represented in the work of these six individuals provide a useful framework for evaluating the relevance and value of systems philosophy for systems thinking and practice in the twenty first century.

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A NEW SYSTEMS VIEW OF ECOSYSTEMS (WITH AN EMPHASIS ON SOILS)

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A fundamental shift is needed in our basic thinking and approach towards understanding and managing complex ecosystems (including soils) to achieve sustainability. After the Newtonian and Darwinian worldviews, the 3rd worldview has emerged that integrates living and nonliving entities as well as space and time cultures. This new worldview emphasizes the interwoven nature of conservation and evolution, the intimate link between internal organization and system function, the systems between extremes, and the unprecedented impacts of anthropogenic activities. Such a new worldview helps the understanding and appreciation of soils as complex, semi-living systems essential to the sustainability of ecosystem services and human livelihood. In the spectrum of things in

nature that range from nonliving to living, soils fall right in the middle—functioning as the bridge between the biotic and the abiotic worlds and possessing enormous internal power as the nurturing ground for life. The co-evolution of fast and slow processes in soils is the nature's way of sustainable development, where hidden forces drive natural succession and non-closed fluxes lead to structural and informational accumulation needed for sustainable functioning. A new kind of physics is explored in this paper for enhanced understanding of ecosystems and soils complexity, including 1) the modification of the Newton's three laws of motion, 2) the internal organization (rather than externality) of ecosystems/soils in response to perturbations, and 3) the medium number syndrome (systems too complex for classical analytics and too organized for statistical treatment). Soils are a great subject for complexity and sustainability study, where non-closed cycles and irreversible thermodynamics prevail. However, modern soil vulnerability to global change and anthropogenic threats is unprecedented—if current land use trends are not adjusted, we may run the risk of losing the ground for sustainability. This paper calls for innovative investigations towards building better human systems that are in harmony with functional natural systems including soils as the foundation of ecosystems.

2345

A SYSTEMIC APPROACH TO LANGUAGE AND SYMBOLIC REPRESENTATION

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In the scientific worldview it is common that we ask our-self how to label the objects and concepts with an appropriated name that describes, defines and diagnoses the thing than we are talking about. In this everyday effort the International Council on Systems Engineering (ICSE) and the International Society for the Systems Sciences development the endeavor "Common Language for Systems Praxis Project" (IFS, 2012).

As part of this common language in the ICSE they identify, explore, and understand the patterns of complexity across next views: 1) The source of the systems thinking or Foundation of the System Science, 2) The systems science theories and 3) The Representation of the System Science (IFSS, 2012).

The present proposal is a contribution to Foundation of the System Science and has been based in the Semiotic view of complex phenomena through the graphs and networks tools of Representation of the Systems Science.

In the First part It is describes why the use of complex science tools in social field. Next it has explained how is the link between Network Theory and Semiotic. Third part presents the results of an application of the approach. Finally it is show some brief conclusions.

2346

DESIGN RESEARCH METHODS FOR SYSTEMIC DESIGN: PERSPECTIVES FROM DESIGN EDUCATION AND PRACTICE

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The recent development of systemic design as a research-based practice draws on long-held precedents in the system sciences toward representation of complex social and enterprise systems. A precedent article (Jones, 2014) established an axiomatic and epistemological basis for complementary principles shared between design reasoning and systems theory. The current paper aims to establish a basis for identifying shared methods (techne) and action practice (phronesis). Systemic design is distinguished from industrial design by its direct relationship to systems theory and explicit adoption of

social system design tenets. Systemic design is concerned with higher-order socially-organized systems that encompass multiple subsystems in a complex policy, organizational or product-service context. By integrating systems thinking and its methods, systemic design brings human-centered design to complex, multi-stakeholder service systems as those found in industrial networks, transportation, medicine and healthcare. It adapts from known design competencies - form and process reasoning, social and generative research methods, and sketching and visualization practices - to describe, map, propose and reconfigure complex services and systems.

Contemporary systems science has evolved a set of preferred theories for system description (or explanation), prediction (or control), and intervention (change). Predominant schools of thought include: Hard systems and system dynamics (control oriented), soft systems and postmodern systems thinking (explanation oriented), and emancipatory (change oriented). However, design applications, and the contributions of design disciplines of industrial, information or service design, have remained marginal in the system sciences. The relationship of systems to design has been developed theoretically, as a fusion of design science and system sciences (Banathy, 1996). “Design” has been typically presented as a process of system design, but has not been explicitly developed as a praxis or discipline of academic study.

In a previous paper (Jones, 2014) I identified 10 systemic design principles shared between design practice and systems theory, which guide design thinking and assess the systemic reasoning of design proposals. These design principles call for the discovery of methodological relationships between systems theory and design – an initial theory of systemic design methodology. The current paper addresses this next stage of development.

The integration of systemics to enrich design methodologies and practice has become imminent. Philosophies (episteme) of design methods can be characterized as rational, pragmatic, critical, generative, and phenomenological. These influences initially gained adherence as design methods or “generations” of design, but have become blended and deeply embedded in design thinking. An emerging consensus in design thinking represents a fourth generation of design methods, based on a transdisciplinary episteme, a techne of generative and participatory design methods, and a phronesis (practical action) of iteration and co-creation. This recent turn in design methods can bears clear relationships to the social systems methodologies in systems science. Social systems, following Churchman, Boulding and others, have always entailed a transdisciplinary orientation to research. Most social systems methods advocate a strong orientation to participatory and democratic stakeholder engagement for collaborative problem resolution. And co-creative, iterative methods have been effective in social systems to enable stakeholders to develop outcomes over time and learn from mutual dialogue over time.

The current paper addresses the commonly employed systemic methods applicable in design practices in co-creative and critical epistemologies. While perhaps a significant number of other assignments of methods to principles might be made based on an exhaustive analysis of all documented methods, these illustrations are presented within the context of the shared principles and methods between systems and design thinking.

2348

A RELATIONAL FRAMEWORK FOR SUSTAINABILITY SCIENCE

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Since publication of a synthesis of Robert Rosen's relational theory in 2011, called R-thoery, considerable progress has been made in defining a general system framework that is both causally based and subject to analysis using category theory. This framework is based on hypothesized natural closure of Aristotle's four causes and implicit fifth level unity or organization of causal relations. The framework is based on holon relations described in the earlier work. In this paper I outline various representations of that framework showing that it is general to many known and practiced systems frameworks for understanding or managing complexity. These examples range from modern applications to anchient history. Based on these comparisons I propose that the causal structure of the R-theory holon does indeed represent a "General System Theory" as initially sought by Ludvig von Bertalanffy and implicitly in the work of Robert Rosen. I also suggest that it may be usefully applied in the emerging discipline of "Sustainability Science" which is seeking such a framework for integrating models of human and natural systems.

2349

ROOTS OF SUSTAINABILITY IN ANCIENT INDIA

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Archaeology of the "Indus Valley Civilization" (IVC) in the border region between India and Pakistan has revealed a much more extensive pre-existing civilization under the Thar Desert, associated with the once mighty Saraswati river revered in the Rig Veda. Assuming we may now dismiss the primary features of the "Aryan Invasion Theory" for lack of evidence (aside from unresolved linguistic issues), the positive evidence of artifacts from the region, paleoclimatology, hydrology, remote sensing, geophysical studies, and textual interpretation suggest instead that the origins of Vedic philosophy may indeed be indigenous, predating the Classical Vedic period by millennia in a more-or-less continuous proto-Vedic cultural development. The emerging picture is convincing enough to now refer to the "Indus-Saraswati Civilization" (ISC) of Harappan and pre-Harappan times, and to hazard a bold, tentative link between holistic aspects of pre-Vedic philosophy (non-duality) and clearly similar cultural images and designs of the ISC. Exploring the evidence for ancient holism we find its core philosophy to be in remarkable alignment with relational theory (R-theory) and its holon framework, reported previously. The remarkably peaceful, organized, and industrious ISC was apparently sustainable for millennia prior to their decline and diaspora between 1900BC and 600BC, apparently related to climate change. That period also corresponds with the rise of Abrahamic religions and dualistic thinking that spread globally to produce the globally dominant scientific and technological revolution we are in today. Ironically, by delving into dualistic thought we lost the ancient knowledge of whole systems, but gained the technology the ISC perhaps needed to adapt. Unfortunately, that great human experiment is threatening even greater changes today, as we struggle to regain the lost understanding of whole systems. Knowing more about ISC and its culture, speculative as such pre-historic studies must be, may be important in that struggle because it may represent an early and successful test of a sustainable philosophy, if that's what it was,

that we may apply to developing a new, more technologically integrated, "Sustainability Science". We recommend an international research agenda for studying "whole systems" in both ancient and modern times. We also suggest a much stronger international effort focused on archaeology of the Indus/Saraswati region, which may be of inestimable importance in the history of Humanity.

Keywords: Vedic, non-dual, holism, Indus, Saraswati, sustainability

2355

A SCIENTIFIC REVOLUTION IN THE PHILOSOPHY OF SCIENCE

Stuart A. Umpleby

In the 1970s a group of people set out to expand the field of cybernetics from First Order Cybernetics, the cybernetics of observed systems, to include also Second Order Cybernetics, the cybernetics of observing systems. In the language of Thomas Kuhn's The Structure of Scientific Revolutions, they were endeavoring to make a scientific revolution. They began by defining the "incommensurable definitions" used in the old and the new points of view. After several years of developing and presenting their arguments and of moving the field from a period of "normal science" to a period of "revolutionary science," they felt that the new point of view was sufficiently widely accepted and that it was time to move to a new period of "normal science." How to do so?

It seems that the way to make such a transition is to use the "correspondence principle." The correspondence principle states: any new theory should reduce to the old theory, to which it corresponds, for those cases in which the old theory is known to hold. Hence, a new dimension should be identified which previously was neglected or assumed to be zero. Cybernetics has added two dimensions, not to a single scientific field, but rather to the philosophy of science, thereby expanding science for all fields. The two dimensions are: 1) amount of attention paid to the observer and 2) the amount of effect of a theory on the system of interest. These two dimensions constitute a scientific revolution in the philosophy of science. The new philosophy of science is a more adequate guide to the development of scientific knowledge, particularly in the social sciences. Current work is focused on how science will change as a result of the change in the philosophy of science.

Keywords: philosophy of science; second order cybernetics; correspondence principle

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LEARNING ACROSS BOUNDARIES: EXPLORING THE VALUE OF SYSTEMIC THEORETICAL INTEGRATION MODEL AND IMPLEMENTATION PROGRAM ON KINDERGARTEN PRACTICES AND HEALTHY DEVELOPMENT AMONG KINDERGARTNERS.

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Recent research developments in various disciplines and interdisciplinary collaborations illustrate the value and importance of learning across boundaries. In the service of healthy development studies in child, personality and social psychology begin to advocate the necessity of promoting explicit comprehension of self management, system awareness and awareness of the self in the system already during preschool years.

This argument is supported by recent developmental research findings regarding increased prevalence of relational aggression already in kindergarten,(Wall Street Journal. May 29, 2014)' and brain based research findings that highlight the important role that brain based executive functions (emotional/behavioural regulation, attention, focus, shifting, planning and organization, working memory) play in facilitating positive adjustment to elementary school, academic success and later success throughout life. In short: The quality of brain-environment interaction during preschool years impacts neuropsychological learning and development across multiple domains of functioning that constitute the foundation for life learning on multiple levels of complexity and across boundaries in diverse systems .

In accordance with Gerrard Miller's living system theory in humans, learning through boundaries begins with intrinsic experiences of the self as a system. Learning across relational boundaries begins already in the infant-primary caregiver attachment system that continues to influence interpersonal development across the life span. Brain research in general and social brain research in particular highlights how brain development is influenced by the physical and social environmental conditions and types of stimulation. Specifically, Executive Functions in the frontal lobe that guide decision making and behaviours develop as early as preschool years.

The purpose of this paper is to present a system based multi-disciplinary model and preliminary results of applied primary prevention program designed to promote self, interpersonal and system awareness and behavioural accountability already in kindergarten. Through systemic oriented educational practices designed to promote the development of executive functions, (including: Emotional and behavioural regulation, attention, focus, shifting, planning, organization, working memory, capacity for self reflection),trained kindergarten teachers guided kindergartners learning process across self, interpersonal and system boundaries. The emergence of accountable self management, interpersonal behaviour and system relations was followed.

The theoretical integrative framework of the systemic model and applied health promotion intervention program includes: Neuro-psychological-educational system, family and attachment system components that are critical for evaluating kindergartners' developmental multi-faceted comprehension of self and others in the kindergarten classroom system.

Action Research methodology underlies the learning process that is guided by the trained kindergarten teachers. Ongoing monitoring, assessment and formulation of structured measurable systemic interventions constitute the implementation program. The outcome of interest is the emergence of self awareness through learning on multiple levels of functioning in regular kindergarten classroom systems.

Quantitative and qualitative findings are presented. Change through learning is reflected on multiple levels of self awareness and executive functions based behaviours. Specifically, quantitative comparisons of executive functions profiles completed by kindergarteners' classroom teachers (with established reliability and validity) prior to and post five months exposure to the implementation program. This constitutes one measure of change that reflects learning through boundaries. Another measure is based on teachers' narrative reports.

The findings are discussed in terms of the health oriented value of system oriented interventions in education systems for all stakeholders: kindergartners well being, teachers empowerment, professional growth and reward and parents. The importance of considering the kindergarten classroom system as a context for social change through organizational transformation is elaborated upon.

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GET, SSD, ESD: THE EVOLUTION OF EVOLUTIONARY SYSTEMS DESIGN

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This paper presents an update of a Festschrift written in honor of Bela H. Banathy and published in a special edition of World Futures edited by Sabrina (Sabre) Brahms twelve years ago.2 The seminal work of Bela in bringing together the domains of systems thinking and design thinking in service of future-creating community based learning systems continues to illuminate the path of action oriented social systems designers. By tracing the genesis of Evolutionary Systems Design (ESD) as a praxis that draws on General Evolution Theory and Social Systems Design methodology, in addition to Critical Systems Theory, we gain appreciation of the role social systems designers stand to play in curating dynamics of life-long learning and human development in partnership with Earth. The contributions made by Bela to the creation of ESD are portrayed as bridging evolutionary consciousness and evolutionary action. Following a brief description of the inspiration and mentorship provided by Bela in this regard, the roots of ESD are traced back to General Evolution Theory. Notions of evolutionary stewardship are shown to have grown out of encounters with Bela and his work at the International Systems Institute, which over time were given operational viability through the methodology of Social Systems Design he developed and brought into practice. The fundamental tenets of ESD are presented and discussed by way of a four stage evolutionary learning framework. This framework is then coupled with more recent research into the dynamics of conviviality following the tradition of Ivan Illich, resulting in an integral four level framework of systemic thrivability from individual to societal to natural to generational dimensions of being and becoming in syntony with life and the life support systems of Earth. Bela's work on Social Systems Design is thereby updated through the expression of Evolutionary Systems Design and contemporary advances in systems and design thinking that take the shift Bela made from systems planning to systems design and bring it to an emerging orientation characterized by systems curation. Finally, the vehicle of Evolutionary Learning Community through which ESD operates is shown to embody the potential for individuals and groups to think, live, and act in harmony with the dynamics of which they are a part as a means to guide the conscious curation of thrivability.

Keywords: General Evolution Theory, Social Systems Design, Evolutionary Systems Design, Evolutionary Learning Community, syntony, thrivability, emergence, curation, life-long learning.

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BOULDING'S SOCIAL SCIENCE GRAVIMETER: CAN HIERARCHICAL SYSTEMS THEORY CONTRIBUTE TO ITS DEVELOPMENT?

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Kenneth Boulding's Skeleton of Science is presented as one framework of increasing complexity of structures, phenomenon, systems themselves, modeling required to capture their essence, and the complexity of the image each level of the hierarchy holds of itself as viewed by the observer of those systems. In this presentation the Skeleton is placed in context of research into hierarchy theory and general systems theory, and the article then discusses how these interwoven areas of research can work to develop new

[2] Laszlo, A. and Laszlo K.C. The evolution of evolutionary systems design. In *World Futures,* 2002, Vol. 58, No. 6-7.

methodologies for transdisciplinary practice, and the evaluation and validation of that practice.

Keywords: Skeleton of Science, Kenneth E Boulding, transdisciplinarity, general systems theory (GST), hierarchy theory.

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THE GENERAL THEORY OF METADYNAMICS SYSTEMICITY: PART 6: NEIGHBOURHOOD AND THE 4D NEIGHBOURING OF NATURAL THINGS

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As a recall to the author's past proceedings, the General Theory of Metadynamics Systemicity is being a publications that - part after part published since 2004 – is developed according to applying the principles of "The Bioethism Transdisciplinary Paradigm" which the author J.-J. Blanc developed since 1996. Thought of an extensive research on "Systems science" that induced to developing a new systemic paradigm, it was termed as a transdisciplinary approach to "Living systems and propicious survival" he named "The Bioethism". A paradigm that is meant to support the acquisition of a large understanding on living systems' as to their naturally getting structured and behaving. For survival, creatures have to adapt to their milieu by "neighbouring" (the verb) within "neighbourhoods" (ecosystems), their events and structures. We will describe their semantic1 differences, as in the word " neighbourhood" being different with the general word "environment", together with the sense given to the expressions: local, glocal and global.

The Universal teradynamics, the "Cosmo-planetary and terrestrial giga and metadynamics systemicity", the "Life's giga and metadynamics systemicity", and the "Biological survival giga and metadynamics systemicity" processes are the core of the General Theory of the Dynamics Systemicity. Resulting from a large research and approach of the whole set of universal dynamics and their retroactivity results effects, "Systemicity" surge from interrelation, intrication2… and interdependency synergies. The systemicity of their atomic and molecular cycles has made and is sustaining both cosmic systems and from then on Life's systems on planet Earth. According to the system type, its sustainability neighbouring is of a survival different time lapse (universal time, biological time...). To exist, cosmic systems and living creatures replicate and evolve within global, glocal and local permanently changing both endogen milieu and external environmental ecosystems.

The Universe Tera, Gigadynamics and Cosmo-planetary Metadynamics retroactive systemicity have participated in the Sun and its planets to form and survive, and particularly Earth orbiting around it on a right "habitable green zone" as a specific and adequate neighbourhood. The General Theory shows the close links between Cosmo-planetary and terrestrial tera, giga and meta-dynamics systemicity, its forces, fluxes and moves cycles convergence that made Life to have happened and thriven. From proto-organisms to humans, their individualities, social traits and behavioural statuses while neighbouring within ecosystems milieu have accounted for the development of the species biodiversity evolving or getting extinct over billions of years.

For example, when the Earth became a "snowball"neighgourhood from a nearly total glaciation (-600 Mo/y), the survival of some bacteria and micro-organisms escaping the drastic extinction of most species, conversely boosted up an extraordinary explosion of marine species bearing quite new functions (- 545Mo/y). Volcanism reheated the planet

from the systemicity of interrelated terrestrial and cosmic metadynamics and heat proximity created seawater tempereratures propicious to bacteria and viruses to revive or thrive again, little by little inducing to microorganisms to appear from the new seawater ecosystemic conditions, the neighbouring components of water became chemically and physically of a synergetic and retroactive systemicity. The right convergence of those biological reasults for duplication and temporal survival were well induced to from the neighbouring of the local ecosystem's neighbourhood components.

The neighbouring3 of sub-atoms, atoms, matters and gas, within a set of dynamics synergetic retroactivity results, promote dynamics (forces and fluxes) which systemicity permanently go at specific directions in the 4D environment of the Universe. So then, Life, when appearing, is a whole set of matters and chemicals which are "neighbourings4" of ecosystemic components as confronted with gravitation, electromagnetism, chemical and physical phenomena…, particularly driven with temperature, water, the "thermodynamics of entropy"and the enegetical chains such as for the livings', the ones called "food chain networks". They are all acting as forces and fluxes which are driving the structure and behaviors diversity of objects, species and things up within their systemic neighborhood and their intricate concomitancy, in other words they exist or occur interdependently with some other propicious things so surviving.

Furthermore, and in order to illustrate such new "reading grid", ecosystemic neighbourhoods are confronted with the driving of terrestrial metadynamics cycles of water, minerals, and climates which currents and their physical effects drive up each "ecosystem's metabolism" into a permanent changing neighbourhood.

The specific bonds and traits of "living creatures" structures and behaviours as well as their evolution trends reveal the survival quality of their neighboring knowledge about actions-reactions (drivers) events. A sense given with ago-antagonistic signals and stimuli emerging from their ecosystemic and socio-systemic metabolism5 and environmental conditions. Neighboring is being the confrontation between an entity body milieu components and the natural environment treating general information "machinery" adequate with the fundamentals of "survival metadynamics" and "drivers" like "symbiosis" and "feedback". Processing stimuli and signals, it sustains the metabolism balance by both internal and external changing conditions effects.

Part five of this theory only described some dynamic drivers: symbiosis, coalescence, convergence and synergy, percolation, phase transition, threshold output, feedback… that permanently influence the systemicity result of cosmic matter, objects and things while interacting among the universal networks of the 4D worlds of cosmic neighbours. Feedback driving their dynamics systemicity survival sustain "the atomic and molecular cycles from cradle to grave".

Part six of this theory, in this new reading grid, is describing some of the effects of the necessary neighboring (as a verb)of any entity existence. At life's level, the "biological" inducer6 of things supports the molecular and proteinic creation of pysicochemical structures and behaviours: it concerns "primordial organisms, their thinking, their societies and cultures" as well as that of "their descendants" (e.g. a cell, group of cells).

The neighbourhood components (cosmic forces effect, matters as well as waters and climate together with the living's networks) are the "building blocks" of one or several intricate ecosystems or one or a group of living individuals. Besides, ecosystem's neighbourhood evolution is not only a darwinian drive but also the consequence in how its living creatures invent and learn next "the sense to be given to things" for survival. Interrelated and interdependent, things and events together with their behaviours from

quite diverse interpretations and expressions are precisely trying to adaptat with circumstances.

Keywords: neighbouring, neighbourhood, survival, metadynamics, survival, symbiosis, feedback, entropy, metabolism, synergy, convergence, coalescence, ecosystem, milieu.

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WOMEN IN RURAL AMERICA: UNCOVERING THEIR VOICES TO IDENTIFY AND UNDERSTAND THE CRITICAL ELEMENTS OF WELL-BEING

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Utilizing action research through a mixed methods approach an understanding of the critical elements required for achieving true well-being in women in rural America will be explored. This understanding will be primarily achieved through the voices of women in rural America within focus groups and one-on-one conversations across three states. Stakeholders to be included in action research process from design, analysis and dissemination of the findings will include women from rural America, experts in the areas of sociology, action research, workplace flexibility, organizational systems, health and well-being and others as needs are identified. The use of stakeholder involvement in the development and implementation of this research will result in a dynamic research design, implementation and findings in the area of well-being within the context of and through the voices of women in rural America.

Women across America are challenged by cultural and familial dynamics, which influence their well-being on a daily basis. In addition to accounting for 50% of the nation's workforce and "two-thirds of the primary or co-breadwinners in American families" (Shriver, 2014), women often find themselves as needing to balance numerous other requirements such as care takers of younger and/or older family members, managing and making healthcare decisions for family members, nutritional planning, transportation activities, etc. Research studies often singularly focus on education, financial stability, or healthcare as being key linear requirements for a successful life. Accepting those requirements as essential, we also believe well-being undergirds those very important modules and is a necessary foundation.

Our intent is to explore through a systems lens, three interrelated dimensions of well-being that we will refer to as the Family Consciousness Model of Well-Being (FCMWB). These three dimensions include:

Family consciousness – the state of being aware of the importance of the family structure in the strength of communities, workplaces and our nation.

Mind-body health – the awareness and activities required for optimal mind and body health.

Supportive relationships – relationships with family, friends, community groups that are required to promote a positive sense of self and satisfaction.

The initial research questions for this research project include:

What are the critical elements within each of the study dimensions of well-being as described by women in rural America?

How are economics, education and health reinforced by the dimensions of the Family Consciousness Model of Well-Being?

How do the findings of this study relate to the findings of the 2014 Shriver Report, "Women on the Brink"?

Concepts explored and defined in this study will include: Family Consciousness, well-being, rural, mind-body health, and supportive relationships. A thorough literature is underway with initial descriptions and definitions developed. The action research process will better define these for appropriate use in the study.

The five phases of this research project will include: 1. Design and development; 2. Pilot study and revision; 3. Research study; 4. Data analysis; 5. Dissemination of findings. The study has been divided into five phases to better allocate appropriate resources, input and general project management.

It is our belief in addition to impacting the understanding of well-being for the participants the findings and recommendations that result from this study will be useful for community, workplace and policy leaders in understanding the true well-being needs of women in rural America.

2365

A (DESIGN-CYBERNETIC) CRITIQUE OF FORMAL EDUCATION

Thomas Fischer and Christiane M. Herr

We see human thinking as moving on a continuous spectrum between what we define as poetry and prose. At one end of this spectrum is prose, emphasizing the identification of difference and thus, the making of distinctions. The primary mode of operating in prose is thus the drawing of distinctions, as discussed by Spencer Brown (1969). At the other end of the spectrum is poetry, emphasizing the identification of similarity, which fosters thinking in terms of metaphor and analogy. Poetic mode of thought in this understanding is characterized by analogical and metaphorical connections as described Lakoff and Johnson (1980).

In our proposed paper and presentation we will show how the spectrum that spans between prose and poetry and its negotiation can in essence be explained in terms of variety and constraints (Ashby 1956), thereby framing this discussing in terms of systems theory. We discuss the cybernetics that arise from moving in between prose and poetry, and in particular, the lack of such movement in contemporary formal education. Curricula of formal education are typically divided between science-based and art-based subjects, and commonly tend to constrain the modes of thought cultivated in such subjects to specific narrow bandwidths on the spectrum between prose and poetry. Design and related disciplines stand out by escaping this focusing and by encouraging students to negotiating and traversing the said spectrum deliberately. We argue that this ability is essentially an ethical one, and that it is neglected in formal systems of education.

Design falls outside the stereotypical arts or science disciplines, and in its education, it aims to enable students to embrace and negotiate between both prose and poetry. In design theory, Rittel and Webber (1973) have characterized the differences between tame and wicked problems. Tame problems can be addressed with given problem-solving frameworks, whereas wicked problems are observer-dependent in that they require a more dynamic and personal type of decision making. According to this characterization, design problems are wicked problems, and resist straightforward attempts at solution based on predetermined frameworks. To address wicked problems, designers make use of any strategy that promises success, including what we initially described as prosaic and poetic thought. In the process of negotiation, designers' decision making is motivated as much by external constraints as internally determined constraints deriving from personal ethics. This allows designers to address what Heinz von Foerster has characterized as "undecidable questions" – questions of an ethical

nature that cannot be addressed by relying on given frames of reference and that only humans can decide.

We first introduce our (design) cybernetic approach to what we describe here as prosaic and poetic modes of thought. We then argue that similar to design, education in other disciplines that are part of more formal education could be enriched by introducing a broader approach, embracing both prosaic and poetic modes of thinking. We illustrate the potential of such changes through case studies that demonstrate how an awareness, appreciation of, and ability to employ a broad range of prose and poetry can generate outstanding innovative work, within and across disciplines.

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2367

SCIENCE OF SOCIETY EVOLUTION

Jim Simms

Inspiration for a science of society was provided by Isaac Newton's Principia (1686). In the 1800s Comte identified the three stages necessary for the development of a science of society. Another century passed before Von Bertalanffy moved the emerging science to Conte's third stage. The universal phenomena of DNA structure was discovered by Watson and Crick (1953). Genetic information was discovered by Nirenberg and Mathaei (1961). Both discoveries resulted in Nobel Prizes. Universal phenomena for minerals, plants and animals were identified by Simms (1971). A classification system for living systems science, including social systems, was developed by Miller (1978). It was demonstrated that the universal phenomena of life applies to social behaviors by Simms (1983). The principles of quantitative living systems science for cells and organisms were developed in 1999. Units of measure are essential for the quantitative sciences. Units of measure for information were developed in 2012 and for knowledge in 2013. Principles of a quantitative sciences of society have been developed.

2368

MULTI-LEVEL ADAPTIVE CYCLES MODEL FOR SERVICE INNOVATION ECOSYSTEM

Kyoichi Kijima

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Service system, one of the most fundamental conceptual models of service research, is a dynamic configuration of people, technologies and organizations and shared information that create and deliver value to customers, providers and other stakeholders. A crucial way to create new value by a service system is to introduce new or significantly improved products (goods or services), processes, organizational institutions, and marketing methods in business practices or the marketplace, i.e., innovation in a broad sense. Innovation is indeed the fundamental source of significant value creation by a service system.

So far most researches on service science have focused on innovation initiated by individual service systems such as companies and research institutions. In this paper, in contrast, we assume service innovation is carried out in the context of a network of service systems rather than an individual service system. We introduce a new framework, Multi-level Adaptive Cycles Model, and argue service innovation from the viewpoint of sustainable network-based ecosystem in society.

Some of new insights obtained by this approach include: (1) service innovation ecosystem basically takes a form of an adaptive cycle, (2) However, to capture its holistic characteristics we need to identify several hierarchical levels in the network and adaptive cycle is just one aspect of innovation ecosystem, (3) Rather, it is more legitimate to identify such another phase of service innovation as dynamic structural change from a level to another in hierarchy, assuming that at a different hierarchical level different logic works.

The present paper first introduces concept of service innovation ecosystem to describe innovation along network consisting of various service systems, all of which interact with each other.

Next, we develop Multi-level Adaptive Cycles Model based on panarchy and transition management approach. Panarchy is a framework for analyzing ecosystem developed to account for the dual, and seemingly contradictory, characteristics of all complex systems, i.e., stability and change. It tries to explain about the complex interactions among different areas as well as different levels, bringing together ecological, economic and social models of change and stability. Transition management theory, on the other hand, has attracted attentions as a framework for arguing governance of social systems for sustainability. The model consists of three levels, at each level adaptive cycles of service innovation ecosystem are found.

Service innovation ecosystem at micro level, is represented as an adaptive cycle with four stages, exploitation, conservation, release and re-organization, where the driving force for the cycle would be incremental innovation or improvement.

At the micro-level (or niche), initiatives and innovations from individuals or individual service systems/organizations challenge the existing regime through innovation.

Such a service innovation adaptive cycle at micro-level may jump to another adaptive cycle at meso level by drastic technological and/or social innovation. The model calls it revolt of the adaptive cycle. The meso-level (or regime) is formed by service systems/organizations and infrastructure as well values, belief systems, norms and unwritten rules and practices. This level is most likely to be aimed at protecting its own existence and status quo.

Revolt and its results may give impact on economy, demography, worldviews and culture at the macro-level (or, landscape) in a more longer time scale.

We furthermore observe and examine several cases of service innovation in terms of the model and discuss continuous and discontinues process in a holistic way referring to sustainability

2371

FAST AND FUNCTIONAL FEEDBACK LOOPS FOR SMALL BUSINESS

Graham Talley, Ashkahn Jahromi

Large corporations have many complex and robust systems they've built, and that they work with on a daily basis. They have access to large data, sophisticated internal software for analyzation, and cross-functional teams to implement the changes they

want to see (whether or not any of this yields the kind of results it's supposed to is the subject for a talk much larger in scope).

In small business, most of this analysis is kept inside the heads of the founders and employees. Following gut instinct (although that is certainly a system in itself) often wins out over more structured forms of data collection and response.

In this talk, we'll look at four different feedback loops that any business can implement from day 1 (or from day 1000) to improve their profits and their sanity.

Keywords: Feedback Loops, Organizational Cybernetics, Small Business

2372

CLOUDY WITH A CHANCE OF ROUGHNESS: AN INQUIRY INTO FRACTAL ROUGHNESS AND SYSTEMS

Billy Dawson

Roughness, as described by Benoit Mandelbrot, is ubiquitous in both nature and culture, found in the distribution of galaxies and in the shape of coastlines, mountains, clouds, trees, and the various ducts of the lungs; also in stock price charts, paintings, music, and several mathematical constructions. This paper explores the concept of system roughness as an approximate measure of the asperous nature of systems; their parts, their wholes, and their relationships.

The hypothesis of this paper is that roughness exists in systems as an identifiable and measurable quality. Additionally, this paper presents system roughness as a simple heuristic for use across various aspects of systems. Visual aspects of system roughness and concepts for application of the system roughness construct will be presented.

Based in the mathematics of fractals, the metrics for systems roughness is a set of logarithmic calculations, which indicate a relative measure of dimensionality, or roughness. System roughness represents an aesthetic for making systems and systems concepts more visible and more comprehensible.

Operating at an intersection of number, language, image, and art, systems roughness can used both as a means of numerical and visual analysis. The phenomenological nature of systems roughness is a measure that is available all five senses. Roughness is not only intuitive, but with minor scholarship, the eye, as well of the rest of the senses can be reoriented to understand it almost reflectively.

Working in a Euclidean paradigm, where shapes are regular and smooth, does not reflect the world in which we live, only a sterilized or idealized version of reality. Diagrams, maps, and charts, as well as mental, verbal, and visual models can offer greater levels of detail and understanding with applied system roughness.

Keywords: roughness in systems, fractals, roughness maps

2373

CHINESE BUSINESS SYSTEMS: A HISTORICAL SYSTEMIC APPROACH

Brian Hilton

This paper argues that the latest crisis in the operation of the global economic and financial system needs approached from a new theoretical perspective. Paul Samuelson argued that there were three possible approaches to analysis, comparative static, dynamic and historical. We argue that the first two seemed to have run their course. Historical analysis approaches reality a little closer that the other two and new tools dynamic games, simulation and non-linear mathematics exist to address issues evident in the latest crisis that are not easily addressed from other perspectives.

2375

TIME AND DYNAMIC BOUNDARIES: THE IMPACT OF ACTION BASED LEARNING

Susu Nousala 1

Research Fellow, Aalto University, Helsinki, Design Department, Creative Sustainability

This work aims at opening for discussion the understanding of the “time” element that is critical for longitudinal development of robust group or action based community activity. The discussion is based on work occurring in multiple sites within a global project “The New Global”.

The learning cycles or epicycle processes are relevant for action-based investigation for organizational and social structures. The question of group behavior maybe influenced by their positioning within a larger adaptive system, the type of focus or determined goals and the type of connections that have been developed.

The author has stated previously (Nousala 2014) that these types of community or group efforts be described as autopoietic systems, that are operating within larger adaptive societal web. The learning process involved in investigating these types of dynamic phenomena need to be themselves dynamic, providing methods that can explore, through longitudinal cycles expose these epicycles at work. The continuous recording of various processes through epicycles provide a means to “qualitatively measure” changes, which would normally go unseen (Hall et al. 2012; Hall et al., 2005; Nousala and Hall 2008; Wenger and Snyder 2000).

These recorded shifts in process provide a means to apply the action-based knowledge gained through project based learning for problem based solving. The success of applying action-based knowledge outcomes really relies on the quality of providing meaningful longitudinal approaches for mapping and recording changes in epicycles. This work This work aims at an exploration through current discussion, discourse and literature regarding the importance of time within the longitudinal approach, posing the question, what lengths of time are required or relevant to develop robust groups or community based actions?

Keywords: Time and longitudinal development, action based knowledge, learning cycles and approaches, robust groups/communities.

2378

SUSTAINABLE EUROPEAN UNION (CHINA/US/UK) APPLYING STAFFORD BEER’S VIABLE SYSTEM MODEL TO DE-CENTRALIZE “THE SYSTEM” (PART 2 OF “A SYSTEM THAT WORKS”)

Jon Li, Institute for Public Science & Art, Davis California USA

Can we de-centralize "the System"?

This is a unified plan for each EU country to de-centralize for sustainability/community self-reliance, with effective use of scarce resources through enhanced problem-resolution information processes. This model is also applicable for China, the United States, the United Kingdom, Palestine, Egypt, South Africa, the Philippines, Canada, Cuba, Mexico and Antarctica.

Whether you use the term "the System" to mean the economy, or society, or the particular institution you are stuck inside of and wrestling with, it is the monster that seems more out of control all the time. Over time, most people's response to growing problems has been to centralize power and control.

Consider de-centralization: maximize the potential that the person who makes the decision SHOULD BE the one with the closest view of reality (what Ross Ashby calls

"requisite variety"). This is a proposal for the EU to use the tools of the Viable System Model by Stafford Beer to build a new grassroots consensus about the direction of society and the economy.

You can use the Viable System Model to cultivate institutional transformation. It would involve mapping a catalogue of all the current organizational activities and responsibilities (ALL of them), which in VSM terminology would be the System 1-2-3 (operations, accountability, management), and then debate what should be the new version (using VSM refinement tools), called System 4, and then identify ways to move from System 1-2-3 towards System 4, refining System 4 as new information becomes available. Senior management is System 5, which mediates between the NOW 1-2-3, and the FUTURE 3-4-5.

For example, on December 2nd to 5th, 2009, the city of St. Veit, Carinthia, Austria. (population 12,000) conducted a Syntegration for the future of the city. Without exception, all the city's influential people participated. The Syntegration was combined with a Viable System Model analysis and diagnosis, a Sensitivity Model for each of the twelve subtopics, a kick-off to a local Ecopolicyade to educate the city's young, and launch an Academy for Entrepreneurs - all of which was done simultaneously. The Syntegration resulted in 120 daily measures for the sustainable, successful and, in energy matters, self-sustaining development of the city. It also resulted in the conviction of all the participants to have found the key to the future. Implementation started immediately and is ongoing.

The Viable System Model has been used by many businesses, organizations and governments - local, regional, national and transnational, and could be used throughout the EU to identify ways to improve both private and public sector organizations in terms of vision identification, goal setting, coordination and management of implementation, and ongoing evaluation of actions taken so far in comparison with the evolving organizational vision of the future.

To apply this decentralized model generally, information describing a person's community and their part in the economy is organized by scale and sector: family (10), neighborhood (100), village (1,000), community (10,000), district (100,000) and region (1 million people); and a dynamic information catalogue for all the parts of a woman's life (a matrilineal model): income, food, housing, health care, transportation, clothing, education, media, entertainment, taxes, managing the economy, public services, infrastructure, utilities.

Measuring Improvement of Quality of Life Governance statistics should measure quality of life and demographic issues as well as economic growth and decay, redefinition and renewal. The VSM analysis encourages looking at real change in the system's environment: commercial, technological, political, social, economic, educational and ecological.

Consequences: The German DMark replaces the EURO, replacing the US dollar as the global currency.

2379

BEYOND SYSTEMS PHILOSOPHY FURTHER CONCEPTUAL TRENDS IN THE HISTORY OF SYSTEMS PHILOSOPHY FROM SYSTEMS PHILOSOPHY TO A PHILOSOPHY OF SCHEMAS

Kent Palmer Ph.D.

kent@palmer.name http://kdp.me 714-633-9508 AdvancedSystemsPhilosophy_01_20140719kdp02a.docx Started 2014.7.19; Draft Version 02 http://orcid.org/0000-0002-5298-4422 http://schematheory.net

Key Words: Systems Philosophy, Schemas, Continental Philosophy

Abstract: Systems Philosophy has played a central role in the development of Western philosophy in general and systems of philosophy have abounded and moved on beyond Systems to consider alternative schemas as has Systems Science. The history of Systems Philosophy is complex and interesting and should be taken into account by Systems Scientists. We build on an account already given from the Greeks to Hegel and offer an account that surveys more recent Continental Philosophy and attempts to identify the cutting edge of Advanced Systems Philosophy.

2382

WHATEVER HAPPENED TO SYSTEMS THINKING?: WHY SOMMERCUBE.COM?

Michael Sommer, sommerduo@me.com

Introducing the SommerCube (S3): a necessary and tangible way to explain / demonstrate / share with practitioners and the public issues regarding Systems Thinking / Cybernetics / Complexity that are not presently available -- even just as conceptual model.

A close look at the networking system which leverages full-spectrum cognitive / perceptual processing, algorithms, and the art of design with an emphasis on advanced thinking, and its reflection upon itself.

A discussion of the Gerald Midgley and Michael Sommer views of Systems Thinking: the "Midgley Hook" and S3. What both of us would like to do, see done in the field --

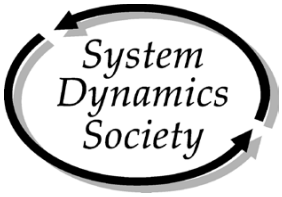
Ending with an explanation / demonstration / audience manipulation of the S3 and what it represents, its tangible benefits.

Author Index

(Numbers in parentheses indicate full paper submitted)

Keyword Index

Sponsor Information



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July 19-23, 2015

Reinventing Life on a Shrinking Earth

PRELIMINARY CALL FOR PAPERS

Overview While the Earth has not changed size in absolute terms, it is definitely shrinking with respect to the activity it supports. We have all experienced the effects of the greater connectivity: global economic recession, global business competition, pandemics, crowding and congestion, depletion of natural resources, strategic acquisition of water supplies, rising health care costs and management, and rapid economic development in many nations, spurring resource depletion, pollution, and climate change. Complex business and societal challenges have arisen from the increasing activity on the globe that conventional institutional designs have failed to address. System Dynamics uniquely provides a strategic framework to explore the challenges of a shrinking Earth, giving a greater understanding and exposing counterintuitive insights that allow us to reinvent our institutions and our lives.

Program The conference program consists of invited and contributed sessions and workshops demonstrating the state of the art in the theory and application of System Dynamics. We welcome all research and documented consulting activities in System Dynamics, including applications of the methodology to solve real-world problems, new technical and software developments, and productive integration of complementary methodologies. The conference schedule is organized by thread so as to create coherent sessions for presentation. The tentative list of threads for 2015 is:

- Business
- Economics
- Environment
- Health
- Human Behavior
- Information and Knowledge
- Learning and Teaching
- Methodology
- Operations
- Public Policy
- Resources
- Security
- Stakeholder Engagement
- Strategy

The annual System Dynamics conference brings together people from around the world to share imporant research and application results. The program includes plenary presentations that showcase important work in the field, parallel and poster sessions that present the most current research and applications, and a full day of skill-building workshops covering topics from basic software use to advanced analysis techniques. Panel discussions, special interest group sessions, student colloquia, a modeling assistance workshop, vendor exhibits, and demonstrations round out the program. The conference schedule provides time for social and professional interaction.

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- Metrorail Station - Orange/Blue Line
- Metrorail Station - Red Line
- GW Police
- One-way Street
- The Vern Express (Connects the Foggy Bottom & Mount Vernon campuses)
- Virginia Science and Technology Campus Shuttle

BUILDING USAGE

- GW Academic/Administrative
- GW Academic/Administrative/Medical (not owned by GW)
- GW Residential
- GW Residential (not owned by GW)
- GW Campus Life/Recreational
- Medical/GW Academic Medical
- GW Preferred Hotels
- Other
- Non-GW
- Under Construction

BY BUILDING NAME (ALL ADDRESSES ARE IN NW WASHINGTON, DC)

26 Academic Center - 801 22nd St
128 Alumni House - 1918 F St
6 Ambulatory Care Center - 2150 Pennsylvania Ave
37 Amsterdam Hall, Philip S. - 2350 H St
133 Aston - 1129 New Hampshire Ave
4 Avenue, The - 2200 Pennsylvania Ave
62 Bell Hall - 2029 G St
75 Building 33 - 2031 F St
66 Burns Law Library - 716 20th St
5 Burns Medical Building - 2150 Pennsylvania Ave
1 City Hall - 950 24th St
58 Corcoran Hall - 725 21st St
24 Crawford Hall - 2119 H St (closed for renovation)
123 Dakota - 2100 F St
41 Duquès Hall - 2201 G St
69 F Street House - 1925 F St
72 Francis Scott Key Hall - 600 20th St
34 Fulbright Hall - 2223 H St
40 Funger Hall - 2201 G St
71 G Street Garage & Law Learning Center - 2028 G St
41 Gelman Library - 2130 H St
91 Guthridge Hall - 2115 F St
3 GW Hospital - 900 23rd St
60 The George Washington University Museum & The Textile Museum (Opening 2014)
131 GW Inn - 824 New Hampshire Ave
54 Hall of Government - 710 21st St
130 Hall on Virginia Avenue (HOVA) - 2601 Virginia Ave
35 Himmelfarb Health Sciences Library - 2300 I (Eye) St
84 Hortense Amsterdam House - 2110 G St
116 International House - 2201 Virginia Ave
111 Ivory Tower - 616 23rd St
33 Jacqueline Bouvier Kennedy Onassis Hall (JBKO) - 2222 I (Eye) St
13 John Quincy Adams House - 2129 – 2133 I (Eye) St
44 Kogan Plaza
20 Lafayette Hall - 2100 I (Eye) St
87 Lenthall Houses - 606 – 610 21st St
68 Lerner Hall - 2000 H St
38 Lerner Health & Wellness Center - 2301 G St
56 Lisner Auditorium - 730 21st St
63 Lisner Hall - 2023 G St
42 Madison Hall - 736 22nd St
21 Marvin Center - 800 21st St
19 Media and Public Affairs Building - 805 21st St
127 Mitchell Hall - 514 19th St
53 Monroe Hall - 2115 G St
32 Munson Hall - 2212 I (Eye) St
124 Old Main - 1922 F St
132 One Washington Circle Hotel - 1 Washington Circle
27 Phillips Hall (at Academic Center) - 801 22nd St
73 Potomac House - 2021 F St
80 Quigley's - 2036 G St
14 Rice Hall - 2121 I (Eye) St
29 Rome Hall (at Academic Center) - 801 22nd St
36 Ross Hall - 2300 I (Eye) St
57 Samson Hall - 2036 H St
25 Schenley Hall - 2121 H St (closed for renovation)
2 School of Public Health & Health Services Building - 2300 K St (Opening 2014)
31 Science & Engineering Hall (Opening 2015)
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67 Stockton Hall - 720 20th St
81 Strong Hall - 620 21st St
64 Stuart Hall - 2013 G St
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74 Support Building - 2025 F St
126 Thurston Hall - 1900 F St
39 Tompkins Hall - 725 23rd St
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145 1776 G St
128 1957 E St
129 1959 E St
16 2000 Pennsylvania Ave
144 2011 I (Eye) St
143 2020 K St
142 2021 K St
141 2029 K St
140 2033 K St
76 2035 F St
134 2100 M St
15 2100 Pennsylvania Ave
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82 2106 G St
83 2108 G St
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85 2112 G St
86 2114 G St
137 2120 L St
92 2121 F St
139 2121 K St
93 2123 F St
52 2125 G St
45 2127 G St
51 2129 G St
46 2129 G St (rear)
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47 2131 G St (rear)
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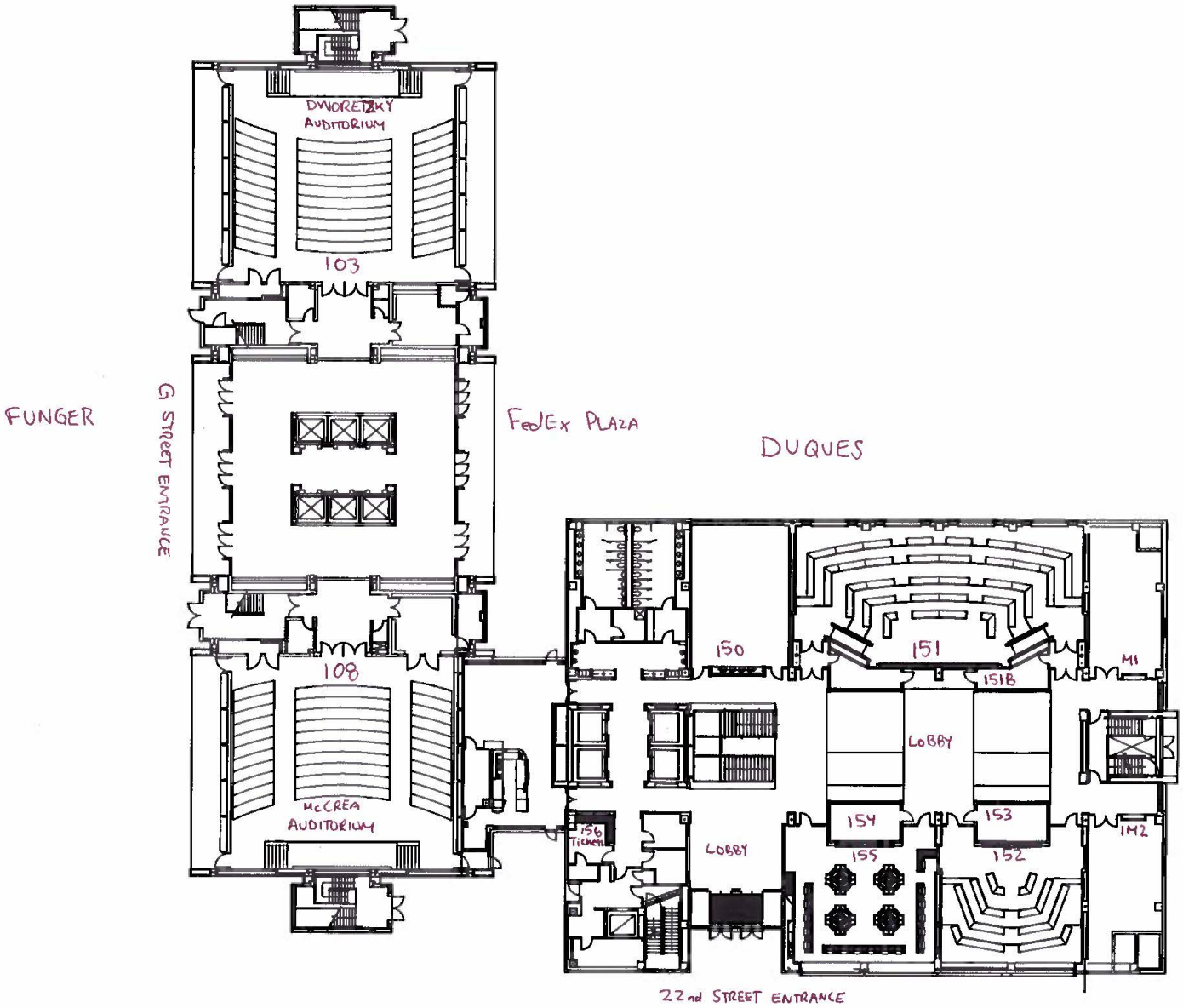
FIRST FLOOR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22nd STREET ENTRANCE

SECOND FLOOR