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Conference Foreword

Dear Delegate,

The 14th ANZSYS Australian New Zealand Systems Society Conference has a number of high quality paper submissions from authors who represent a cross-section of international and Australian national perspectives in terms of systems thinking. These papers reflect the emerging themes of Thinking and Design, Environment Thinking, and Thinking in a Virtual World. At the same time, we are faced with the ongoing dilemma of the continuing quest to push Systems Methodologies and Systems Practices into a world that is largely ignorant of the broader set of "Systems" approaches. The papers published represent a robust and diverse collection of ideas, and the conference committee is pleased with the overall quality of this year's submissions. All published papers were double blind peer-reviewed before acceptance into the conference for publication. There were a total of 49 papers submitted for review from which 33 were accepted and presented.

Conferences such as the 14th ANZSYS Australian New Zealand Systems Society Conference take a great deal of co-ordination, time and effort in order to bring together the right people in a common forum in order to advance the wider security understanding and to progress the various research directions. To that end, I express my thanks to the conference committee for their hard work and dedication to the conference cause. In particular, I would like to commend the various reviewers, editors and proposal submitters for their devotion and perseverance in the face of countless other duties and engagements. In concert with this gratitude is another vote of thanks to the administrative staff within the School of Computer and Information Science, as well the SECAU Security Research Centre, for their patience, good-humour, and professional approach to ensuring the successful running of the conference.

Sincerely,

David Cook
14th ANZSYS co-ordinator

Conference Committee

William Hutchinson (Chair and Editor)	Committee
Trudi Cooper (Editor)	Committee
Terence Love (Editor)	Committee
David Cook (Administrator)	Committee

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Towards a Design Theory for Collaborative Technologies: Electronic Discourse in Group Decision

Jim Sheffield
Department of Information Systems and Operations Management,

Abstract
This article proposes a design theory for collaborative technologies based on pragmatism and multiple discourses (Habermas 1984; Schultze and Leidner, 2002). The practical value of the theory is explored via empirical data gathered in the context of an intervention enabled by Group Support Systems (GSS) in regional governance and comprehensive urban planning. During the study representatives of the regional council and territorial authorities meet to evaluate three scenarios prepared over a seven-year period. Qualitative measures were obtained of the degree of confusion (lack of understanding) and conflict (lack of trust) before and after the meeting, and participant performance and satisfaction with electronic discourse. The focus question is "Do electronic discourses enhance participant's understanding and trust in scenario planning?"

TOWARDS A NEW FRAMEWORK FOR EVALUATING SYSTEMIC AND PARTICIPATIVE METHODS

Gerald Midgley
Integrative Research for Sustainability (IRfS) Group, ESR.

Abstract
Systems practitioners often make significant claims for the value of their methodologies and methods. However, when evidence is presented to support these claims, it is usually based solely on the practitioner's own reflections on single case studies. Less often, practitioners set up post-intervention debriefings with project participants using questionnaires. While the latter is an improvement on researcher reflections alone, there have been few attempts at systematically evaluating across methods and across case studies undertaken by different practitioners. This is understandable because, in any given local intervention, contextual factors, the skills of the practitioner and the purposes being pursued by stakeholders are inevitably going to affect the perceived success or failure of a method. The use of standard metrics and even qualitative criteria for comparison can therefore be made problematic by the need to consider what is unique in each intervention. So is it possible to develop a single evaluation approach that can support both locally meaningful evaluations and longer-term comparisons between methods? This paper offers a framework for the evaluation of methods that seeks to do just this. Research on the framework and associated tools is in its infancy, but pilot studies suggest that it is promising. Comparing across methods will ultimately require the development of a longer-term international research program, and the paper serves as a call for participants in this.

Exploring critical systems thinking and its application to quality in higher education

Shelley Paewai
Massey University

Abstract
The purpose of this paper is to provide a brief account of ongoing doctoral work that seeks to explore quality in higher education using a critical systems approach. The rationale and justification for the use of critical systems thinking in the particular context of education is presented, together with the core elements identified as necessary for establishing a critical systems approach. Implementation of the tasks, tools and methods associated with the (continuously evolving) critical approach are discussed in terms of their relevance in the study, and their relation to critical systems thinking. The paper concludes with some reflections about the use of critical systems thinking as a research approach.

Fashionable Nonsense: A Socratic Dialogue

Jim Sheffield
Department of Information Systems and Operations Management,

Abstract
Researchers, implicitly or explicitly, ground their work in concepts of inquiry. Understanding and critique of another's work may be limited by commitments to opposing epistemologies. Researchers that assume that reality is a concrete structure may find it difficult to appreciate the work of researchers that assume that reality is a projection of human imagination, and vice versa. This paper reviews an historical discourse, centered on an incident known as "Sokal's Hoax" that critiques the domain of 'science' from multiple perspectives. The central themes in Sokal's concept of science, and parody of another's concept of science are presented as a Socratic dialogue. An analytical framework is suggested that may assist in surfacing epistemic commitments, and identifying the nature of dialogue marked by different attitudes towards different worlds of knowledge.

Systemic Problems in Information Technology Adoption and Use: A Systems Thinking Perspective

Arshad Raza
ECU School of Management

Craig Standing
ECU Management

Abstract
Understanding and creating the conditions under which information systems will be embraced by human organizations (thinking systems) remain a high-priority research issue. Despite numerous benefits associated with Information Technology (IT), there exist some intervening factors (systemic problems or issues) that impede technology's widespread adoption and use in organisations. Established information technology adoption models like TAM, TRA etc. view technology adoption from the users' perspective without taking a strategic perspective into account. As an alternative focus we suggest that addressing systemic problems can be a method of reducing fundamental barriers to organizational progress. This paper presents some real life examples of IT projects in organizations which experienced failures or barriers related to IT adoption processes. The issues are framed as systemic problems and are analysed from a 'systems thinking' perspective. The paper argues that some of the issues contributing to the failure/barrier cannot be easily explained by traditional user acceptance models like TAM or TAM2. The paper presents a number of systems thinking principles that can be used to analyse organizational contexts. It also provides some recommendations and suggests a new research direction based on the marriage of 'Systems Thinking' approaches and 'Adoption Model Theories'. This research will help in identifying the relationships between the determinant factors of the technology acceptance models and the concepts involved in systems thinking approaches. We believe the integration of the two approaches will facilitate improved technology adoption, organizational learning and change.

System Dynamics in Aged Care-Service Mix Model for Older People in CMDHB

Keming Wang
MIB, University of Auckland

Tricia Fitzgerald
Fitzgerald &Associates

Abstract
Health of Old People (HOP) is one of the main programmes currently funded by the Counties Manukau District Health Board (CMDHB). System dynamic modelling is a part of CMDHB's Older People's Strategy "to plan future services for older people by developing a system dynamic model focusing on the coordination and integration across the continuum of services to ensure the variety and capacity of services meet their assessed needs". The scope of this programe crosses over nearly all sectors, including primary and secondary healthcare, community and institutional care. Its population is also involved in nearly all other funded programmes, such as Mental Health programme, Chronic Care Management programme, and Let's Beat Diabetes programme. Therefore, the policies made for HOP have multiple effects on other sectors in the system; likewise policies applied to other areas have consequences on HOP as well. Thus, this provides a rich and complex policy environment.

The model building process in this study involved intensive group meetings and workshops, where sector representatives, including consumer representatives, contributed their thinking to the model. Meanwhile, results from the model forced members to rethink the entire process and their judgements. This forms an organisational and sectoral learning process, which is departure from conventional 'technical' approach to model building. Thus the ST/SD approach not only provides an integrative model for policy making, it creates a learning environment for the stakeholders to examine and test their mental models.

A Systems Approach to the Design & Development of a Helicopter Fleet Management System - Phase 1

Axel Schauenburg
The Sir Lawrence Wackett Centre, RMIT University

Arvind Sinha
The Sir Lawrence Wackett Centre, RMIT University

Abstract
This research is part of a major helicopter acquisition program. The program aims to rationalise the number of helicopter types operated, simplify operational requirements and reduce through-life-support costs. A coherent fleet management system (FMS) is to be developed and modeled for the rationalized number of helicopter types. In the first phase of research the current practices in aerospace technology management of helicopter fleets and futuristic operational deployment is investigated to establish the design and development requirements of the FMS.

The research adopts a systems approach for a holistic analysis of the FMS requirements. The FMS is considered in a typical input-process-output configuration. The four key inputs considered for the development of the FMS are as follows:

Technology Needs: It covers an analysis of the platform and systems on-board including the health & usage monitoring systems.

• Operation Support Needs: It covers an analysis of present and future rotary-wing roles & missions and the associated support needs.

• Schedule & Availability Needs: It covers an analysis of the stipulated maintenance schedule of the manufacturer and the availability targets of the fleet operators.

• Operational Environment Needs: It covers an analysis of the environment in which the platform is to operate and its impact on the technology.

• The analysis of the four inputs resulted in the development of the system hierarchy and the system configuration. The system hierarchy comprised of the following three subsystems at Level 1:

• Platform: The platform comprises of the structure, the systems (power plant, rotor, mechanical & avionic systems) and the payload requiring the repair & maintenance support.

• Infrastructure: The infrastructure comprises of the requirements of the repair & maintenance bases and the associated personnel and equipment.

• Schedule: The schedule coordinates the type of aircraft to be supported and the associated personnel and equipment.

The development of the system configuration required the identification of the attributes /

functional characteristics of the systems in the hierarchy. The investigation of the functional characteristics resulted in the identification of the design & development requirements as follows:
• Platform: The health & usage monitoring system provides preventative & corrective maintenance scheduling & planning for failure prediction & detection / isolation.
• Infrastructure: It is to include the infrastructure requirements of the repair & maintenance and spare parts supply to meet the operational readiness.
• Schedule: It includes the provision of operational readiness to meet availability targets through efficient scheduling of missions, maintenance and training of aircraft and crews. It also includes the assignment of ground support and maintenance equipment.

The systems approach adopted in this research will provide an avenue for a holistic analysis to address the aspects of rotary-wing operations and support. The system hierarchy and structure provides an in-sight of the fleet management components and its functional characteristics, and the operational environment.

The next phase of research investigations is for the development of FMS design methodology. This will be followed by a generic FMS design for simulating the FMS capabilities, the end output of the program.

Systems Perspectives in Health Knowledge Management

Jim Sheffield
Depatment of Information Systems and Operations Management,

Abstract
This paper reviews three cases from the health knowledge management literature chosen as examples of a separate focus on critical, soft, and hard systems. These prioritise knowledge normalisation, and knowledge application, respectively. The case on operating theatre relationships prioritises knowledge creation via a focus on personal experience, and interpretations and judgments made under severe time constraints. Memorial Sloan-Kettering Cancer Centre in New York City prioritizes knowledge normalization via extensive consultations among specialists to achieve a consensus for action. Access Health prioritizes knowledge application via the execution of standardized procedures using explicit knowledge. In practice, all three systems perspectives operate simultaneously. Each provides evaluation criteria that guide distinct aspects of systems integration. Yet the tensions remain, and attempts to resolve them may account for many of the stresses of working in health.

Design Concerns in Creating New Diagrams

Donald McDermid
School of Computer and Information Science

Abstract
This paper describes three concerns relevant to anyone interested in developing a new diagram. Diagrams are used widely in many spheres. In the area of information systems development, diagrams are used by both developers and users alike to communicate, to analyse, to verify and so on. Further, over the years many different types of diagram have been created by experts in the field if not in creating new diagrams. Yet within the Information Systems community little has been recorded by way of documenting the kinds of issue, systemic design concerns of diagram development if you will, that any diagram developer should consider if they wish to leverage past experience in the field. This paper reflects on experiences in developing a diagram that models business rules and identifies three concerns that appear to be relevant to diagram developers in information systems generally if not to a wider audience.

Found Difficult and Left Untried

Rosalind Armson
Department of Communication and Systems

Abstract
In this paper the author reflects on her experience of working to enhance the systems-thinking capabilities of a university and reflects on reasons why so few managers adopt systems thinking, except under a few specific circumstances. Her experience is examined in the light of Ackoff's findings and his concept of 'mess'. Soft Systems Methodology is used as an 'understandascope' to arrive at some painful conclusions about some inherent limitations on the usefulness of Systems Thinking.

The Origin and Foundational Development of Structural Logic

Vincent Vesterby
Independent Philosopher

Abstract
THE ORIGIN AND FOUNDATIONAL DEVELOPMENT OF STRUCTURAL LOGIC

ABSTRACT
Structural logic is the manner in which the intrinsic qualities of something that exists determine the kinds of relations that that something can have with other things that exist. The kinds of relations that occur in a situation then determine the patterns organization of the structure and process of the situation. Because all the material objects and systems we see about us are foundationally composed of the same set of elementary particles, which combine into atoms, which combine into molecules, which in turn combine into all the objects and systems, those objects and systems are distinct from one another by way of the pattern of organization of their components. The structural logic intrinsic to reality, to that which exists, plays its roles from the spatial, temporal, and material foundations of that which exists all the way to the most intricate complexities of biological systems and to the immensity of galaxies. The intrinsic structural logic of components, relations, and patterns of organization can be used as a tool of analysis and understanding. That the factors that play foundational roles are still present and still playing their roles at advanced stages and higher levels of the development of reality is a nearly universal aspect of reality. These foundational factors provide insight into the nature of those advanced stages and higher levels. This paper presents an introduction to the origins of structural logic.

Designing On-line Learning Systems using Participation

Shona Leitch
Deakin Univeristy

Matthew Warren
Deakin Univeristy

Abstract
The review of literature pertaining to systems analysis and design and the design of systems for on-line teaching and learning has identified some “gaps” and shown the need for participation in educational system design. This paper presents research which was conducted to develop an approach for the design of educational systems involving the participation of student and academics in the design of educational on-line learning systems.

A Systems Approach to Design of an Intelligent Data Management Tool for Health and Usage Monitoring Systems – Further Developments

Dipesh Parekh
Sir Lawrence Wackett Aerospace Centre, SAMME, RMIT Universit

Arvind Sinha
Sir Lawrence Wackett Aerospace Centre, SAMME, RMIT University

Abstract
A Health and Usage Monitoring System (HUMS) provides the status of functionality and structural integrity for diagnosis and prognosis of the rotorcraft components. This research is part of a major helicopter acquisition program. The program aims to rationalise the number of helicopter types operated, simplify operational requirements and reduce through-life-support costs. A Fleet Management System (FMS) is to be designed and developed including a coherent HUMS system for the rationalised number of helicopter types.

This paper adopts a systems approach based on systems engineering to the design of an Intelligent Data Management Tool (IDMT) for HUMS systems – HUMS IDMT. An advanced military rotorcraft platform is intended to be the application platform. A systems approach is implemented to develop a systems hierarchy in order to identify the key components of the total HUM Management System (HUMgtS) at all levels. Furthermore, a systems structure is established to identify the relationships and attributes. Having established a systems hierarchy and structure, a discussion pertaining to the design of HUMS IDMT is provided in terms of the health and usage monitoring capabilities. The key capability to be developed was identified to be Flight Regime Recognition System (FRRS).

It is envisaged that the HUMS IDMT will be integrated with the FMS tool which is being concurrently developed. The resultant customised fleet management maintenance tool will aid the maintenance personnel via increasing efficiency and economy of fleet management. Future work will focus on the development of FRRS for the HUMS IDMT.

An Organic Approach to Systems-driven Information Management

Shirlee-ann Knight
Edith Cowan University

Abstract
Numerous attempts have been initiated over the past several years at the Department of Agriculture and Food (DAFWA) to create and implement an information management policy or framework which would facilitate the agency's growing need to properly support its information flow. Commissioned in 2007, a report into the agency's information management "state", described that state as "fragmented".

When confronted with the observation that an organisation's information is fragmented, it is natural to assume such a state is deficient, and therefore must be managed, or consolidated. It is far less natural to step back and consider that perhaps information fragmentation is normal and part of the way humans share information.

Proposed is an innovative approach to information management within large organisations which embraces a fragmented, or decentralised, model of information systems as a reflection of how information organically flows within a living system.

The quest for a general system theory for any particular perspective - does it ever exist or has it been there all the time?

Thomas Wong
Ancient Balance Medicine Education Center Ltd

Yan Huang
Ancient Balance Medicine Research Institute

Abstract
Sciences have been developed throughout human history in order to search for a set of basic components and their relationships to one another within a certain field. 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.

In this paper, the properties of a general theory which can be applied in any particular perspective are analyzed. Some of the existing fundamental theories in different fields are investigated; including set theory in mathematics, relativity in physics, differential diagnosis-cure process in Traditional Chinese Medicine, Taichi Yin-Yang theory in Taoism, and Five Systems theory in the teaching of Buddha.

Keywords: General System Theory, Taichi Yin-Yang system theory, set theory, relativity, Differential diagnosis-cure process, Traditional Chinese Medicine, the teaching of Buddha, differentiation, Systems Thinking/Sciences Education,

OPEN DEMOCRACY SUPPORTED BY GOVERNANCE BASED ON EXPANDED PRAGMATISM AND TESTING OUT IDEAS

Janet McIntyre
Flinders University

Dr Denise De Vries

Darius Pfitzner

Abstract
The paper is a resource for a demonstration workshop on prototype software designed with Aboriginal service users and providers. The research aims to narrow the gap between service outcomes and perceived needs. It relies on extracts and commentary on a forthcoming book in press entitled “User Centric Policy to Address Complex Needs” to be published by Nova Science. The policy potential to enhance democracy and governance within and across nation states is discussed. The proposed open democracy and open governance process supported by a prototype has the potential to address diverse cultural perspectives and complex needs. It is based on exploring ‘if-then’ scenarios. The software could provide a platform for e-democracy and e-governance, because it provides a means to balance local individual needs with universal collective needs in an ongoing cycles. The process and software could make participatory action research on policy affordable and effective.

Design Thinking: Ways to Review the Project Process for the Built Environment (BE

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Faculté de l'Aménagement, Université de Montréal

Pierre De Coninck
Faculté de l'Aménagement, Université de Montréal

Abstract
The well noted absence of design thinking in problem setting and inquiry into ‘that-which-can-be’ is directly related and caused by the persistent theoretical and methodological paradigm in which projects are embedded. This specific condition is a direct cause to the many symptoms that affect the built environment industry today. It is suggested that a reassessment, of design and/or organizational project theories and approaches, through design thinking is desirable. Design thinking being articulated around systems thinking, it allows for a resetting of complex issues, in a global and sustainable perspective, in which the stakeholder plays a predominant role. Therefore, the systems approach within the complexity paradigm, proposes a richer perspective and articulation of the project process environment variables. This paper studies the design thinking process through project behaviour and is consequently bringing forward the ‘cohering project’ concept, within a real case research scenario. The proposed procedure assembles an array of existing models, compounded to form a design thinking toolbox for problem setting and project formulation, focusing on stakeholder involvement and structuring process throughout the design process. This process we refer to as ‘management by design’. The research embodies the systemic approach The actor-stakeholder dynamics, organizational theory, the project concept and the nature of design and design inquiry are reviewed in order to implement a design thinking approach towards project behaviour in the Built Environment. Comparing the differences between the traditional approach to project development and management (that focuses on the organized project) and the project as an organizing process (that focuses on the organizing project) shows the advantages of design thinking for improving the actor-stakeholder participation..
Keywords: systems thinking, design thinking, management by design, the cohering project, actor-stakeholder dynamics, project management.

ICT Initiative of SAARC Agriculture Centre in the SAARC Region

Saleemullah Sohoo
SAARC Agriculture Centre-Bangladesh

Abstract
South Asia is the home of nearly 1.42 billion people-one-fourth of the world population, living on 2 percent of the world's income. Nearly 50 percent of its people live below poverty level- at less than a dollar a day. Most farmers operate on small farms. About 80 percent of the farms have an average size of 0.6 ha. Average farm size in some countries is much less than the region's average.

Agriculture in the SAARC countries forms the major economic sector that provides livelihood to about 70%-80% of the population, employs about 60%-70% of the work force, and contributes between 24% and 50% to GDP. With continuing population growth and a fixed land base, small farms are getting smaller. Much of the small farms are perhaps too small to be productive and supportive of sufficient livelihood for the families that they support. The small- farm agriculture in the SAARC region is therefore unable to compete in the global market. The impact of trade liberalization on small farms apparently seems to be adverse as they are to compete with the developed country's highly subsidized agricultural produce.

Technological revolutions in the last few decades and the consequential changes in the agriculture systems accelerated its cropping intensity in the current century. The developments in Information Communication Technologies (ICTs) and the Internet in particular have revolutionized the entire Agriculture field, generating new market, changing the structure of the Agriculture distribution channels and re-engineering all processes. ICT in Agriculture sector is of special significance and plays a vital role due to the transformations relating to the delivery of services as well as agricultural products. Accordingly, various high tech information and communication technologies are in use in the agriculture sector around the world. These technology ranges from the agricultural product development, marketing, distribution to training agriculture sector personnel etc. The demand for agricultural information is now stronger than ever before. Worldwide, Information and Communication Technologies (ICTs) have become invaluable tools for agricultural research and development.

SAARC Agriculture Centre (SAC) proposes that ICT needs to be conceptualized in its many facets, perceptions, and in its manifold impact in farming societies. SAARC Agriculture Centre (SAC) has been striving to foster such research partnerships among institutions and other stakeholders in the SAARC region. The Centre initiated ICT based Network and developed regional networking of stakeholders through Information and Communication Technology (ICT) and establishment of specialized agricultural knowledge system. SAC empowers farmers providing market information and forecasts. Agricultural research has greatly contributed to increased food production in the member countries of SAARC.

This Centre plays a vital role in identifying the gap in livelihood means, poverty, awareness etc. between the urban and the rural area of the SAARC region. This paper tries to highlight some of the areas where the SAARC member countries (Afghanistan, Bangladesh, Bhutan,

India, Maldives, Nepal, Pakistan and Sri Lanka) should concentrate so that all the members can become beneficiary of agricultural information through ICT based information system. The paper discusses different technology usage from the perspective of agricultural research, extension, product processing and marketing. The findings reveal potential growth of the agriculture sector in SAARC countries through the use of ICT.

Designing Out Crime in Western Australia: A Systems Approach to Policy Development.

Paul Cozens
Curtin University of Technology

Abstract
Designing Out Crime is a system and a process for reducing both opportunities for crime and the fear of crime. These ideas, also known as crime prevention through environmental design (CPTED), form part of the Western Australian (WA) government's Community Safety and Crime Prevention Strategy and it is promoted by all other Australian States, as well as by the United Nations and the governments of North America, the UK, Europe, South Africa, Singapore, New Zealand and Chile among others.

This paper presents the key concepts of Designing Out Crime and discusses the development of evidence-based government policy in WA. Internationally, although most countries provide policy guidance on designing out crime, it is largely piecemeal, uncoordinated, fragmented and dispersed across many policy areas and departmental agendas. WA's Designing Out Crime Strategy (OCP, 2007) attempts to consolidate the multi-disciplinary and multi-agency dimensions and objectives of these ideas and adopted a systems approach to analysing and tackling this problem. Crime prevention is no longer considered as the sole responsibility of the police and the Designing Out Crime Strategy seeks to embed the ideas across relevant aspects of government policy, particularly the planning process. Essentially, it attempts to encourage policy-makers and practitioners to proactively 'think crime' in designing all 'products' ranging from the design of cities, neighbourhoods and streets, to buildings and the spaces within them and finally to the 'products' which are placed within such spaces and used by the community.

The paper provides a narrative of an innovative attempt to adopt a systems approach to developing and promoting the relatively new ideas of Designing Out Crime, across the policy spectrum. A highly coordinated and multi-agency systems approach will ultimately be required to effectively implement the aims and objectives of WA's Designing Out Crime Strategy, and it will be interesting to see if this vision can be realised.

Phosphorus, food and ‘messy’ problems: A systemic inquiring into the management of a critical global resource

Dana Cordell
Institute for Sustainable Futures (ISF) at the University of

Abstract
This paper presents a process of systemic inquiry into the roles, relationships and perceptions in the management of phosphorus resources in the context of global food security. Phosphorus, like water, energy and nitrogen, is critical for food production. All modern food production and consumption systems are dependent on continual inputs of phosphate fertilizers derived from phosphate rock. Yet phosphate rock is a finite resource under the control of only a handful of countries – mainly China, Morocco and US. Production of current global phosphate reserves could peak in 30 years, within decades of peak oil. Given this situation it is surprising that phosphorus is not considered a priority in the dominant discourses on global food security or global environmental change. Checkland’s Soft Systems Methodology offers a framework to guide an inquiry or ‘learning process’ into the nature of the problem situation and system failure, incorporating results of an analysis of stakeholder interviews, a substance flows analysis and an institutional analysis. The soft systems inquiry reveals that not only is there no stakeholder consensus on the nature of the problem, there are no international institutional arrangements, much less an international organisation, responsible for monitoring and facilitating the long-term sustainability of phosphorus resources for food production. Further, without such an actor and associated institutional arrangements, there is no ‘feedback loop’ that can correct the system. Given the critical nature of phosphorus to all modern economies, this is a concerning finding and warrants further analysis, deliberation and enabling of change.

Influencing the influencers of learning: Academic Development as Systemic Intervention

Don Houston
Staff Development and Training Unit, Flinders University

Abstract
This paper presents a perspective on the connections between systems thinking and systemic practice, higher education as a system, and academic development as a field of practice within higher education. The field of academic development is characterised by dilemmas, tensions and uncertainties of identity, place and practice as the functions of academic development diversify in an increasingly demanding and complex environment. The paper explores several inter-related propositions. Firstly, that systems thinking provides some potentially useful lenses for exploring the complex and contested system that is academic development. Secondly, methods and methodologies from within systemic practiced can add greatly to the effectiveness of academic development interventions towards improvement. Thirdly, academic development provides a means to promote systems thinking and systemic practice in higher education. Systems concepts and systems thinking provide useful insights to help recast the dilemmas and challenges as opportunities to progress the ideas and practices of academic development. By modelling systems thinking and systemic intervention in their own work, and introducing their clients to systems ideas and practice, Academic Developers are potentially well place to help realize the potential of systems thinking and systemic practice in higher education.

Creativity to Productivity: A Comparative Case Study

Kay Fielden
Unitec

Abstract
In this paper, a theoretical model (Bounded Innovation Management Model (BIMM)) is described that provides a theoretical foundation for tracking the path of creativity to productivity in two large organisations. This model is based on the four core systems properties of control, communication, structure and emergence, as well as the four additional characteristics of whole system, incentives, positional role and final outcome. Applying BIMM to these large organisations suggests that formal structures within each organisation acted against the free expression of creativity in developing innovative solutions.

Dissent, Conflict, Enquiry: Is Environmentalism Science Communication?

David Low
Monash University

Abstract
Environmentalists often present science-based arguments that are designed to persuade the public toward a belief that will inform future action. Can environmentalism therefore be thought of as a type of scientific communication? In this paper it is argued that it can. Drawing on the semiotic logic of Charles S. Peirce, the paper shows how environmentalism's feelings of concern for the environment are transformed into demonstrations of concern, which are, in turn, transformed into systems that guide action. These three stages or phases are called ‘three grades of concern’. The three grades of concern are linked to Peirce's semiotic categories to show how three distinct styles of environmental argument can be identified: whistle-blowing (the category of feeling); demonstrating (the category of reaction); and enquiry (the category of human-nature mediation). These three grades of environmental rhetoric are then applied to a case study in which an evolution of concern about rainforest destruction by unsustainable logging is examined. The case study demonstrates how the feelings of concern for the environment of the Penan people of Sarawak's rainforest became the subject matter of demonstrations in Australia, and how, in turn, the rainforest concern demonstrated in Australia became the focus of a consumer guide called the Good Wood Guide. The paper's aim, then, is to show how environmentalism can be viewed as a method of enquiry that opposes established knowledge, but not necessarily scientific method. Science, in its search for truth, continually challenges the status quo in order to create new ideas. In this respect, scientists and environmentalists share a common methodology.

Systems in the World at Large: A Critical Reflection

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Abstract
Many of us in the ANZSYS community believe that we are thinkers, theorists and that we practice what we research in the community, in industry or for the environment. A review of papers published in the ANZSYS07 proceedings has been conducted that considers the following: where the paper is positioned in time – past, present or future; whether the paper is discussing a direct link with industry, the community or the environment, what level of critical reflection the author reflects in the way in which her/his topic is discussed; where the paper is positioned with respect to systems theory; and what, if any systems model development is proposed and/or applied. This multi-way analysis has been applied to the 66 papers in the ANZSYS07 proceedings, not all of which were presented. The analysis only applies to the written documents – not to any discussion that ensued from conference presentations.

Motivational Information Systems: Case study of a University Research Productivity Index and 6th Extension to Ashby's Law

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Trudi Cooper
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Abstract
Information systems are widely used to map and chart organisational activities for management to motivate staff. We have coined the term 'motivational information systems' for information systems that have this role. This paper describes one example of recent research by the authors using a case study to investigate the internal and external dynamics of motivational information systems. In this paper, causal loop modeling is used to understand the dynamics of a motivational information system in a large organisation: a university-wide motivational information system intended to motivate academics to increase research outcomes. The analyses and findings of the research led to identification of a sixth extension to Ashby's Law of Requisite Variety. The research described in this paper is part of a larger program of systems research by the authors investigating the application and extension of Beer's, Viable Systems Model, Ashby's Laws of Requisite Variety, Checkland's Soft Systems, Critical Systems Analysis, System Dynamics and Causal Loop Diagrams to situations in which these tools are not commonly applied.

Reprising "wicked problems": social learning, climate change adaptation and the sustainable management of water

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Abstract
An inquiry into the practices of neologising, reifying (and categorizing and typologising) was conducted through the use of a question: what is it that we do when we do what we do? as an heuristic device. The systemic inquiry was motivated by an awareness that the terms "wicked" and "tame" problems, coined forty year sago have been poorly taken u despite growing evidence that situations with the named features of "wicked problems" abound and are of increasing concern to humans (e.g. the global water crisis and human-induced climate change). It was concluded that the processes of transforming understandings and practices by taking up the concept of "wicked problems" can be hampered by (i) the way in which language acts as a social technology and (ii) arrangements that preclude novel configurations in the flow of emotioning, crucial to epistemic and identity shift. Practices associated with the coining, acceptance and reification of new concepts can also produce unintended consequences. These findings have implications fro research design in a "projectified world".

Improving the performance of government child welfare organisations using systems methods and perspectives

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Suzanne Regan

Edgar Marthinsen

Abstract
Improving the performance of government child welfare organisations using systems methods and perspectives

Dr Suzanne Regan, The Management School, University of Lancaster
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Professor David Thorpe, University of Trondheim (Visiting Professor, University of Western Australia)

Social workers in state child welfare organisations have to make sense of and form a stabilised view of social disorders which appear to threaten the well-being of children. This entails a process of categorisation which in turn enables their agencies to configure appropriate responses to disorder. This paper will explore a number of issues surrounding the problems created by social workers' categorisation practices. It will show how in the English-speaking world these difficulties often have the effect of excluding vulnerable children and families from programmes which were originally designed to bring benefits to the poorest and most disadvantaged sectors of the population. The paper will show how the application of the analysis of boundaries developed originally by Churchman (1979) and later by Midgley (2000) can be applies to child welfare practices and develop new, more beneficial outcomes for some of the most vulnerable children and families known to local child welfare agencies. An example will then be given of systems practices in a UK agency, using the notion of "joined-up government" and research was used to significantly reduce the numbers of children removed from home and placed in residential and foster care. The process of creating and reflecting on new categories based on narrative (case file text) enabled managers to focus interventions on the most vulnerable families.

This paper is particularly relevant to current social and political and media concerns about "child protection" in Australia and New Zealand. It will demonstrate the relevance of systems science to state child welfare programmes and it will include UK and Scandinavian enhancements of developments which actually first occurred in Western Australia fourteen years ago.

The design of a design course: using a systems approach to address the needs of teachers and students

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Abstract
In 2009 Western Australia introduces a suite of new courses in senior secondary school. Previously only a limited number of subjects could be used to obtain a tertiary entrance rank, this will now grow to 52 courses. One of these courses is Design. The Design course subsumes several previous subjects, including Visual Communication (Photography), Graphic Technology, Technical Graphics and elements of the Art and Design subject. These subjects come from both the Arts and the Technology and Enterprise learning areas. Addressing the needs of both these areas whilst valuing their unique subject knowledge, has required careful management of course development.

Particular concern has been raised by teachers coming from a Manual Arts/Technical Graphics background. Early versions of the course omitted specific mention of these areas and teachers were concerned that they might lose the subjects that they had spent time developing. In some case long careers had been invested in the subject, especially in Technical Graphics.

In resolving these tensions it was necessary to look at the larger picture and to see the course, its development and teachers' responses in the context of a whole system. Extensive consultation was carried out with teachers from all systems and sectors and all relevant professional bodies. In response to the feedback obtained several processes were put into place to guide the development of the course and to gain teachers' acceptance.

Habermasian Analysis of Comprehensive Urban Planning

Jim Sheffield
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Abstract
A design theory for collaborative technologies was proposed in a companion paper entitled "Towards a design theory for collaborative technologies". this paper explores the practical value of the theory via empirical data gathered in the context of an intervention enabled by Group Support Systems (GSS) in regional governance and comprehensive urban planning. During the study, representatives of the regional council and territorial authorities meet to evaluate three scenarios prepared over a seven-year period. Qalitative measures were obtained of the degree of confusion (lack of understanding) and conflict (lack of trust) before and after the meeting, and participant performance and satisfaction with electronic discourse. The focus question is "Do electronic discourses enhance participant's understanding and trust in scenario planning?"

Rethinking Systems Thinking

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Abstract
Systems Thinking refers to a set of approaches that can be used to learn about and make decisions regarding improvements to dynamically complex systems. They are distinguished from other approaches by their focus on the whole and the study of interactions among the parts of a system, rather than the parts themselves. While a focus on interactions helps in understanding complex systems and identifying appropriate improvements, it is necessary to use detailed knowledge of the parts and other aspects of a system to implement any improvements. This paper addresses this issue by introducing a novel Systems Thinking approach which uses detailed knowledge of the parts to both understand the whole, and to build the systems required to implement necessary improvements.

Systems mapping, systems practice: Assessment in the primary and secondary education sectors in New Zealand

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Abstract
As part of a review of New Zealand Ministry of Education's national assessment strategy, an exercise to map the assessment system in the primary and secondary education sectors was undertaken. The causal loop modelling (qualitative system dynamics) approach to systems thinking was utilised. Key stakeholders met for a couple of group model building workshops where the main variables associated with the assessment system were identified. Subsequently a smaller group developed a systems map, analysed the main feedback loops, and developed and analysed a range of assessment scenarios. This paper discusses and reflects on this 'systems mapping' exercise.

Integrated System for Fashion Design using Computerised Wholegarment Knitwear Production

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Abstract
This paper reports doctoral research undertaken at Curtin University of Technology into the possibilities of integrating the systems of high fashion knitwear design and the programming and operation of computerized wholegarment® knitwear machines to the point of 1st sample prototype. To date, in prototyping garments, these have been three separate and incommensurate systems. This has resulted in many problems, inefficiencies and loss of creative and competitive advantage. Costs and time to market are high; technicians compromise garment design to make garments easier to program and faster and cheaper to produce; knitwear designers do not understand the creative potential and limitations of the computerized wholegarment® knitting; prototyping new designs is slow and prone to failure; changes to garments are unnecessarily complex and expensive. This research has investigated the potential to integrate the three roles into a single unified high fashion wholegarment® knitwear design prototyping system in which a fashion designer operates the wholegarment machine directly and undertakes much of the programming role previously undertaken by technicians. The investigation has been undertaken across 8 semi-commercial high fashion knitwear design projects.

Problem Structuring For Research Students: Evaluating a Visual Semantic Scaffold

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Abstract
Problem structuring for research students in virtual tutorials requires a visual semantic integrating conceptual model, architecture, or ‘scaffold’. Heterogeneous communities require a scaffold that is customizable for use in different subject areas, and extensible for use in research that proceeds from multiple theoretical perspectives. This report describes such a scaffold and empirically tests its usefulness in graduate research and health knowledge management learning communities. Subjects exposed to the scaffold placed randomized paragraphs in the correct location with an error 44% less than that associated with random placement. Scaffolding exercises for the very first, and subsequent, tutorial sessions of a practice-oriented health knowledge class are described.

A Hub for Education and Research: Linking New Zealand manufacturing and universities through systemic development for enhanced communication

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Don Houston
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Abstract
The project discussed in this paper is intended to develop mechanisms to link New Zealand's universities' collective capability in providing manufacturing education and research and represent this capability as a harmonious system of university provision to stakeholders. The project is underpinned by Stafford Beer's conception of viable systems model (VSM) which has been incorporated to guide both the design of the intended outcomes of the project and the functioning of the project itself. In terms of the VSM the primary intended outcome from the project is to design and activate "system 4" - the development/intelligence/marketing function - for the universities' manufacturing education and research functions. Unlike most attempts to link universities with industry, the project is not focused on a single university's connection to its environment but rather is focusing on the universities collectively as the organization- or system-in-focus. The context, design and initial phases of the project as a work in progress are the major foci of the body of the paper. Its intended outcomes and their anticipated benefits for both the New Zealand manufacturing sector and universities also will be described briefly. The final section of the paper considers the potential transferability of the methodology and the intended product – the knowledge network and hub – to other contexts.