



**Proceedings of the 18th
UK System Dynamics Chapter
Annual Conference**

**Theme:
System dynamics for developing
strategy in the real world**

Thursday 14th April – Friday 15th April, 2016

The Shard

Timetable and contents

Thursday 14th April	
12:00	Registration and light refreshments
13:00	Welcome by Chapter President
	Session 1
13:10	The Powertrain Technology Transition Market Agent Model (PTT-MAM) and application to EU transport policy. Gillian Harrison and Christian Theil (JRC)
13:40	Are all swans white?: Improving the Adaptive Response of British Telecom through the transformative fusion of cybernetics, systems dynamics and social capital Steve Brewis CEng (Chief Research Scientist, British Telecom)
14:10	OSCAM: 20 years of making better operating and support cost estimates of fleets of ships and aircraft for the US Department of Defense Stephen Curram (Decision Analysis Services Ltd) Brittany Basilone (Naval Surface Warfare Center, Carderock Division)
14:40	Tea break
	Session 2
15:20	Modelling the economy as if real data matters Simon Roberts (Arup) Colin Axon (Brunel University)
15:50	From problem-solving to problem-prevention with model-based management Kim Warren (Strategy Dynamics)
16:20	<i>Geoff Coyle Medal for system dynamics</i> Award committee (UK Chapter of the International System Dynamics Society)
16:40	Chapter President: Concluding remarks
17:30	Wine reception at Azzurro
18:30	Optional dinner at Azzurro

Friday 15th April	
8:45	Arrivals — coffees and teas
9:00	Introduction to the day Simon Shepherd (University of Leeds)
9:05	Session 1 Behavioural Operational Research: The contributions of System Dynamics Martin Kunc (Warwick Business School)
9:50	Session 2 – Group model building Group model building David Carter (Plymouth University) Jennifer Morgan (Cardiff University)
10:30	Coffee break
11:00	Group model building (Continued)
12:30	Lunch and Poster session
13:30	Chapter AGM This short session will report on the status and activities of the UK Chapter, and provide an opportunity to elect new representatives to the Policy Council
14:00	Student presentations and student prize award
16:00	Close

Introduction

Welcome

A warm welcome to all delegates at our 2016 Annual Conference. This year has a theme of ‘System dynamics for developing strategy in the real world’ and comprises six talks on Thursday afternoon from several perspectives in applied consultancy work and research. On Friday morning we have an interactive workshop based on group model building and a presentation reviewing the application of SD for behavioural operational research. In the afternoon we have a poster session and six student presentations covering a wide set of issues and demonstrating the good work going on training the next generation of SD practitioners.

I would like to thank the UK System Dynamics Policy Council for their contribution over the last year and for helping to arrange this event. In particular I would like to thank Warwick Business School and Martin Kunc in particular for help in providing such a great venue.

Many thanks and hope you enjoy the conference.

Simon Shepherd (President of the UK Chapter of the System Dynamics Society)

UK Chapter of the System Dynamics Society policy council

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Presentation Abstracts

The Powertrain Technology Transition Market Agent Model (PTT-MAM) and application to EU transport policy.

Gillian Harrison and Christian Theil (JRC)

We present an introduction to the EC JRC IET Powertrain Technology Transition Market Agent Model (PTT-MAM). This is an extensive System Dynamics simulation model running up to 2050, developed around conceptual market agents and incorporating major factors that influence technology market shares in the EU light duty vehicle road transport sector. The model seeks to integrate a wider range of market, industry and technology dynamics compared to other known models to date, in order to provide better understanding and analysis of market trends and policy options. Several scenarios which explore the dynamics of the powertrain transitions are presented and the findings illustrate that the developed model is able to give strategic insights to authorities, manufacturers and infrastructure providers regarding their respective decisions, policies and challenges in relation to medium and long-term trends in the EU road transport sector.

Are all swans white? Improving the Adaptive Response of British Telecom through the transformative fusion of cybernetics, systems dynamics and social capital

Steve Brewis CEng (Chief Research Scientist, British Telecom)

Businesses have become very adept at managing individuals in the form of human capital - defined as the skills, knowledge and experience of individual employees within the company required to execute the 'task'. In the past, with relatively stable markets, this was adequate, but the current competitiveness in our markets have put pressures upon our margins as well as the need to respond quicker to our customers. It is therefore no longer sufficient to manage the individual assets within the business. In the knowledge economy of the 21st century businesses must manage the inter-connected assets of the business, moving it away from the individual and its associated cost paradigm to the network and its required adaptive paradigm. This new network is what we term Social Equity and is what connects various forms of human capital. Using social equity, cohered through highly effective conversation, we can tackle problems holistically coming up with solutions that generate more value.

BT serves the UK Customer base from a range of Network Technologies, its organisational structure comprises of a Networks Organisation that serves the customer through a number of Market facing units (MFU's). The challenge for the Networks Organisation is that it needs to adapt continuously to a changing environment whilst ensuring that the cost to 'serve the customer' through the MFU's is kept to a minimum'. How can the Business Dynamically create this optimised service oriented operating plan whilst running scenarios against various futures and distilling a given future at the speed of thought into a coherent operating plan. This talk will give you an insight of how the Research and Development unit have approached this problem and the range of tools and modelling techniques it has developed to support a 'social network approach' to network management.

Steve Brewis is a Chief Research scientist for BT. He is a Chartered Engineer and holds a first class honours degree in Engineering. He started his professional career as a Marine Engineer in the Merchant Navy where he was fascinated in experiential learning, i.e. having conversations with your environment, as he was fortunate to have a 'real ship' to experiment upon.

He later left to join the National Health Service where he was responsible for the commissioning and ongoing management of a large district general hospital. It was in this role he became involved in the design of self-adaptive control systems for the control of 'comfort' in operating theatres. Again he used his 'conversational approach' by having 'an empty operating theatre' to experiment upon. It was while he was having these conversations through the models of comfort that he discovered Ashby's law of variety. It was also in this role that Stephen won a National Award for his work in the field of Energy Management.

Stephen left the Health Authority to join BT where he has held a number of senior Management positions ranging from District Payphone Manager, Business Consultant for BT Telconsult which involved running external management courses for other telecommunication companies around the world.

Stephen now holds the position of Chief Research Scientist in BT where his research interests have come about from a greater awareness of organisational complexity and the challenge this possess for context and adaptation. It is in this area that he met the Late Stafford Beer and was fortunate to work with him in his later years. Stafford influenced Stephen's thinking significantly as well as many of his peers. As a lasting legacy Stephen became one of the co-founders of SCiO, setup to take his work forward. Stephen has continued to advance the thinking in this field that we know as organisational cybernetics and has given many talks and presentations on the subject.

Stephen's current challenge is in Improving the Adaptive Response of BT through the transformative fusion of cybernetics, systems dynamics, social capital and Biological Stigmergy facilitating the creation of CONVERSATIONAL white spaces. Ideas need sex and these conversational white spaces provide the mating ground, the space of a shared understanding where novelty and creativity arise.

OSCAM: 20 years of making better operating and support cost estimates of fleets of ships and aircraft for the US Department of Defense

Stephen Curram (Decision Analysis Services Ltd)

Brittany Basilone (Naval Surface Warfare Center, Carderock Division)

The Operating & Support Cost Analysis Model (OSCAM) is a System Dynamics tool that is used widely by the US Navy for estimating operating and support costs for ship classes and aircraft types. It plays an important role in developing submissions for milestone decisions during the US Department of Defense procurement process. It is now 20 years since the first prototype OSCAM model was developed. In that time it has changed from a niche model to a standard tool used by many cost analysts.

The presentation will give a brief history of OSCAM, examine the key changes to the model that have enabled it to become a tool for a widespread user base, and provide an overview of the programmes that it has been used for and the types of decision-making it has supported. The presentation will also consider the factors that have contributed to the longevity of OSCAM, and highlight the lessons learned.

Stephen Curram, Ph.D., is a Managing Consultant at Decision Analysis Services Ltd. He is an Operational Research practitioner, with more than 25 years' experience in the field, specializing in cost modelling, System Dynamics, and applications software development. He was previously a lecturer in Operations Research at Warwick Business School where he also gained a PhD in simulation and artificial intelligence.

Brittany Basilone is the submarine cost team lead for the Naval Surface Warfare Center, Carderock Division in the Cost Effectiveness Branch. With 8 years of cost estimating experience, Brittany has provided cost support to several ship platforms for NAVSEA. She also acts as OSCAM Program Manager. Brittany received her Bachelor's degree from Washington & Jefferson College in Mathematics and Education, and a Master of Science degree from George Mason University in Operations Research.

Modelling the economy as if real data matters

Simon H. Roberts (Arup)

Colin J. Axon (Institute of Energy Futures, Brunel University)

We present a framework and model that fuse time-series data for GDP, balance of payments, population, employment, energy, housing, and transport. Our model links energy demand through to final economic consumption, yet complies with national accounting standards and industrial classification. The dynamic aspects assume that supply follows demand, but is constrained in the short-term by physical infrastructure. At the same time, investment grows the physical infrastructure. We minimise the exogenous variables and tuning factors by using historical data to calibrate relationships between the time-series. Our model regenerates historical data dynamically as a basis for projecting forward scenarios to discuss pathways to a lower carbon future.

By examining the time-series ratios between different datasets, we find the key functional relationships that are robust over time. This enables us to analyse complex policies such as investment for decarbonisation, and the effects on employment and trade. The model is neither an exclusively economic, physical, nor social in nature, but upholds the integrity of each world-view through retaining their unique time-series datasets. As our model is agnostic to the way in which a nation organises its economy, it has the potential to be applied to economic development and climate change mitigation for any nation.

Simon Roberts is a physicist and Associate Director in the Foresight Group of Arup, an international design and engineering consultancy. The group employs a range of foresight techniques, such as Drivers of Change cards for workshops. Development of this modelling capability is at the quantitative end of the scale of these techniques. Prior to joining Arup, Simon was R&D manager in a manufacturer of high power laser engraving systems for the print industry.

Colin Axon is a Lecturer in the Institute of Energy Futures at Brunel University London. He researches the use of energy in the urban environment and the limits to natural resources. His main areas of interest are in transport, electricity networks, energy security, resource efficiency, and the application of robust methods for metrics and indicators. He has published more than 110 reviewed articles and technical reports.

From problem-solving to problem-prevention with model-based management

Kim Warren (Strategy Dynamics)

Most published work about system dynamics models describes efforts to solve a problem - there is some undesirable situation that people want to understand and work out a fix. Indeed, accepted wisdom in the field is that modelers should "model the problem, not the system". One top professional even described SD models as like Kleenex tissues - use them once then throw them away. [Exceptions do exist of SD models being used for continuous system management, but such examples are rare].

If taken literally, this mantra has two unfortunate consequences. First, because of the lengthy time and high cost of developing unique models, the method is affordable only for the most costly problem situations. Secondly, it bars SD from becoming embedded in organisations' normal, continuing management processes. If a CEO asks "*Can you help me better manage my business?*" our answer, apparently, must be "*No - we only fix problems*". So, the CEO turns to Finance and other support functions, who wheel out the tired old spreadsheet models that are not fit for purpose because they do not deal adequately with the ubiquitous accumulating stocks, feedback, threshold effects and interdependencies that SD handles completely.

SD models *can*, though, be used as the basis for continuous sound management. Any enterprise is an 'engineered system' and every engineering field that deals with non-static constructs deploys equivalent engineering control theory to ensure those systems function well. This session will describe two contrasting cases where SD models are being used in this continuous manner. The first concerns a fast-growing marine engineering business that wants to govern its strategy continually with a model driven by live data on its performance and its market. The second case concerns the provision of elderly-care homes in England and Wales, for which reliable long-term provision has now been devolved to over 150 local authorities. In both cases, the aim is not to "solve a problem" but to ensure, continually, that problems do not arise in the first place.

Kim Warren is an experienced strategy professional, teacher and writer. After 15 years in senior strategy roles, Kim joined the faculty at London Business School, teaching on MBA and Executive programs. Realising serious limitations with the strategy methods available, he developed the powerful strategy dynamics frameworks. He is author of the prize-winning *Competitive Strategy Dynamics* (Wiley, 2002), a major strategy textbook [Strategic Management Dynamics](#) (Wiley, 2008), and e-book summary of the method – [Strategy Dynamics Essentials](#) (Kindle, 2011). He is also co-owner of [Strategy Dynamics Ltd](#), which publishes "serious games" and other dynamics-related learning material for management, and the user-friendly modelling application, [Sysdea](#). Most recently, his work has proved directly transferable to non-business domains, including International Aid and the provision of elderly-care capacity.

Friday Workshops

Behavioural Operational Research: The contributions of System Dynamics

Martin Kunc (Warwick Business School)

Without doubt, behavioural research is making a significant impact on many academic disciplines. Its status as the source of some of the most interesting research in the social sciences is unparalleled. Therefore it is not surprising that the interest in Behaviour and Operational Research (OR) is burgeoning, where the theoretical and empirical developments in the behavioural field are beginning to make an impression on OR academics and practitioners alike.

The talk will discuss the contributions that System Dynamics can do to the area of Behavioural Operational Research based on a collection of chapters for the book titled "Behavioural Operational Research: Theory, Methodology and Practice" to be published in 2016.

Dr Martin Kunc is an Associate Professor of Operational Research and Management Science at the University of Warwick. He has a wealth of experience including as an independent consultant in a range of sectors, including working on projects in media, pharmaceutical, financial services, consumer goods, and the cement and wine industry. He is an expert in strategic modelling for evaluating strategic decisions in human resources, marketing, performance measurement, supply chain, and has experience of working on projects evaluating regional innovation systems (such as the World Bank and the role of universities).

Group model building

David Carter (Plymouth University)

Jennifer Morgan (Cardiff University)

Explore the connections between how management are perceived and the value of stock reflected by the market in this short introduction to Group Model Building based on a simple concept model and your views captured using a couple of scripts from the latest Scriptapedia publication to add essential detail. Work alongside others from different backgrounds to discover what might affect the stock price as the manufacturing case study plunges from one crisis to the next. Come along, contribute your ideas and enjoy the session (further resources to be made available online prior to the conference).

Dave Carter is a PhD scholar at Graduate School of Management within Plymouth University's Faculty of Business. He has published in high impact journals, read by industry as well as academics, on aspects of participative model construction and the benefits that can be derived from appreciating complexity in groups. He has previously researched improvements for balancing demand on police services against the supply of resources. His work has revealed the fallacy of previous strategies designed to reduce waste and now suggests that new resourcing strategies - those that can be tested in a dynamic environment - may now be necessary for many of the UK Home Office forces facing omnipresent reductions. Only through understanding dynamic complexity can systemic issues be addressed effectively: those wicked problems that frequently lie below recurrent patterns of observable behaviour. David is currently researching new causal theory explaining the dynamic problems of K12 enrolment alongside multiple agencies from the public sector.

Dr Jennifer Morgan is a research associate at Cardiff University School of Mathematics, working as an embedded OR modeller in Cardiff and Vale University Health Board. Her current project involves developing mathematical models to improve data quality and data capture and inform dynamic demand and capacity modelling. Previous research experience includes the development of System Dynamics and Discrete Event Simulation models for a range of operational and strategic problems in Healthcare and Public Health. Her research interests lie in the process of model development to facilitate the construction of appropriate and useful models to inform decision makers, facilitated modelling of healthcare systems and mixed method modelling.

Poster Session

Student Posters

Modelling Dementia Care and the Support of Informal Carers in Tower Hamlets

Stuart Maxwell

A 'small-world' Stock-Flow Consistent (SFC) economics flight simulator in system dynamics with questions of methodology, pedagogy and impact

Neil Smith (Plymouth University)

Other Posters

Model Building with Soft Variables

John Hayward, Rebecca Jeffs, Leanne Howells and Kathryn Evans (University of South Wales)

Online Collaborative Simulation Platform

Peter Lacey (WSP, in association with Brunel University & Isee Systems)

The Dynamics of School Choice

David Carter (Plymouth University)

Building a Strategic Framework for Identifying Patterns of Relational Value (Rv) in Different Health and Care Settings

Dr Paul Grimshaw (University of Leeds); Peter Lacey (WSP); Prof. Linda McGowan (University of Leeds); Dr Elaine McNichol (University of Leeds)

Horizon 2035: The role of SD in developing a vision for the health, social care and public health workforce in England

Siôn Cave (DAS Ltd)

Tom Lyscom, Graham Willis, Matt Edwards and John Fellows (Centre for Workforce Intelligence)

Student colloquium

Student Presentations

A 'small-world' Stock-Flow Consistent (SFC) economics flight simulator in system dynamics with questions of methodology, pedagogy and impact

Neil Smith (Plymouth University)

Student Prize Presentations

A Model for the Evaluation of Transport Safety Policies in Commercial Motorcycle Operation in Nigeria

Oluwasegun Aluko (University of Leeds)

System Dynamics assessment of renewable integration in island electricity systems

George Matthew (Open University)

A simulation approach to the evaluation of shared service centres

Gregory Asante (University of Bedfordshire)

Modelling homeowners decisions to renovate their homes to be energy efficient

Yekatherina Bobrova (University College London)

Integrating GMB and Gaming to Tackle Fragmentation in the U.K. Housing Sector

Shane Carnohan (European Master in System Dynamics)