

THE SCIENCE OF BETTER AT THE HEART OF ANALYTICS

# INSIDE O.R.

OCTOBER 2015 NO 538



## MADE BY ROBOTS

:: INSIDE THIS MONTH :: :: :: ::

ROUND TABLES IN GLASGOW

ANALYTICS WITH EVERYTHING

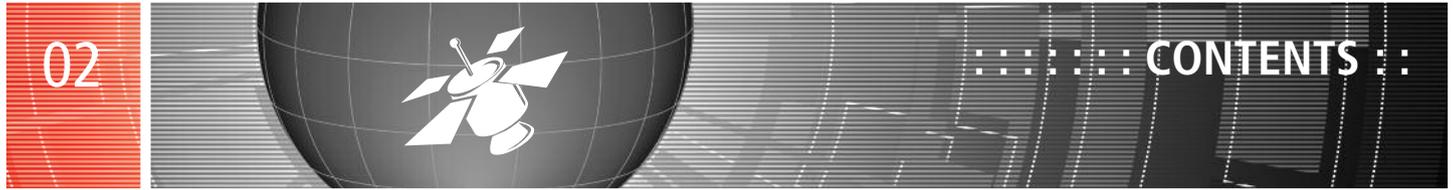
YOUTH ISN'T NECESSARILY A FOREIGN COUNTRY

DATA VISUALISATION: WHOSE JOB IS IT ANYWAY?



**THE OR SOCIETY**

[www.theorsociety.com](http://www.theorsociety.com)



# EDITORIAL

## JOHN CROCKER

We have just about come to the end of the silly/conference season, I was going to add 'summer' but I think I must have been asleep that day. EURO2015 in Glasgow was, of course, the big event of this year and there are several articles again this month which relate back to it.

Someone way back in the early days of my career referred to conferences as 'renewing the faith'. Certainly they provide a great opportunity to meet people and find out what is happening in the wider community. They can also be a good source of inspiration on how to solve a particular problem – it really is surprising how many times one discovers that someone somewhere has been faced with a problem just like yours. Conferences are only one of the many benefits a professional society can offer but are these many and varied benefits enough for today's world? Is there still a place for the professional society or has it had its day? This is the question being asked in a joint meeting with the RSS in December (see 'Youth isn't necessarily a foreign country'). Maybe we should all read Jim Bryant's book on Drama Theory (see News in Brief) to see if this can help us find a way forward.

'Who do you think you are' has proved quite a popular television programme. This theme was taken up by Frances O'Brien at EURO2015 in one of the 'Making an Impact' (MAI) sessions, by Ruth Kaufman in last month's 'Leader' and again by Frances this month in her 'Leader' and in a trial webinar that will have happened by the time you read this, but alas not in time to be able to include a report in this issue (something to look forward to next month).

There is no doubt that O.R. is alive and making an impact, the third (and final) report on the O.R. in Practice stream at EURO2015 is proof of that. The article relating the work of three Government Operational Researchers is also a firm testament to that effect.

In the early days of O.R. the two major complaints were 'lack of data' and 'lack of computing power'. In 'OR -30' we see that the microcomputer was starting to become the platform of choice. True, it was still very limited but it could out-perform humans and was generally more reliable, in certain areas, at least. Today, we seem to be inundated with data but making sure it is valid and accessible is still a concern although Mirhaji and Aasman seem to have found something of a solution to this problem with their semantic data lakes (News in Brief) – these seem to have all the benefits of relational databases but without many of the disadvantages.

It used to be said that O.R. is for the young so I am particularly looking forward to attending this year's Y2OR conference (in my role of roving reporter/talent scout). You will, of course, have to wait patiently until November to find out whether I was successful in finding any willing, budding reporters.

## :: NEWS :::::

- EDITORIAL ----- 02
- ROUND TABLES IN GLASGOW ----- 03
- IN BRIEF ----- 04
- BLACKETT MEMORIAL LECTURE ----- 07
- GOVERNMENT OPERATIONAL RESEARCHERS –  
WHAT DO THEY DO? ----- 08
- CAREERS OPEN DAY 2015 ----- 12/31
- SW16:
- FOCUS ON BEGINNER AND ADVANCED TUTORIALS --- 14
- SW16-CALL FOR PAPERS ----- 15
- MARTIN SAVELSBERGH - ADVANCES IN CRITERION SPACE  
SEARCH METHODS FOR MULTIOBJECTIVE MIXED INTEGER  
PROGRAMMING ----- 19
- POPULARITY. THE LONG AND SHORT OF IT. ----- 20
- YOUTH ISN'T NECESSARILY A FOREIGN COUNTRY ---- 21
- COURAGE AND INTEGRITY – THE RELATIONSHIP BETWEEN  
ANALYST AND DECISION MAKER ----- 22
- EURO 2015: O.R. PRACTICE STREAM – CASE STUDIES IN  
O.R. AND ANALYTICS PART III ----- 24
- DATA VISUALISATION: WHOSE JOB IS IT ANYWAY? --- 32
- TAX RELIEF ON PROFESSIONAL SUBSCRIPTIONS ----- 34

## :: LEADER :::::

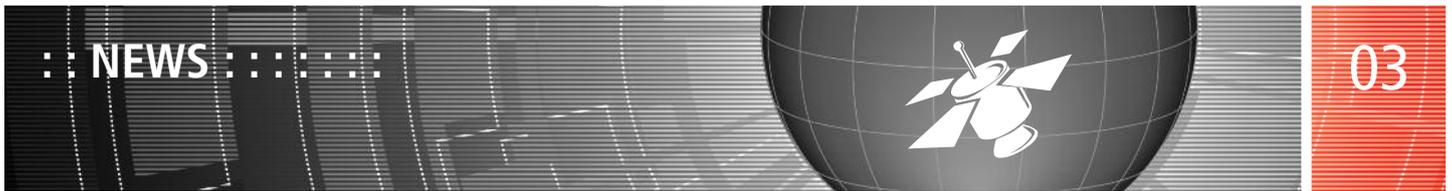
- WHAT I DID THIS SUMMER -----10

## :: ANALYTICS :::::

- ANALYTICS WITH EVERYTHING -----18

## :: REGULARS :::::

- CONFERENCE NEWS ----- 06
- NEWS OF MEMBERS ----- 11
- TRAINING ----- 16/17
- SPECIAL INTEREST GROUPS ----- 26
- REGIONAL SOCIETIES ----- 28
- SOCIAL MEDIA ----- 30
- LAST WORDS ----- 35



## ROUND TABLES IN GLASGOW

**GALINA ANDREEVA AND JANE PARKIN**

Among many exciting activities of Making an Impact (MAI) stream at the recent EURO2015 conference in Glasgow there were two round table discussions that provided a platform for the exchange of views on the barriers and opportunities surrounding academic-practitioner (a-p) collaborations.

Round table 1 concentrated on expectations from both sides, potential benefits, problems and challenges. It was chaired by Dr Stephen Lorrimer, Head of Profession for O.R. in NHS England and Department of Health. Other panel members were:

- Gregor Brandt, Director of Operations Research, ORTEC Consulting Group, the Netherlands
- Laura Reid, Chief Executive, SIMUL8 Corporation, UK
- Thomas Archibald, Professor of Business Modelling, University of Edinburgh Business School
- Cathal Brugha, Professor Emeritus, School of Business, University College Dublin, Ireland
- Dr Simon Taylor, Department of Computer Science, Brunel University London.

'What can we do to support collaboration?' was the focus of Round table 2. It was chaired by Richard Eglese, Professor of Operational Research, Management School, Lancaster University, UK, and included the following panel members:

- Ahti Salo, Professor of Systems Analysis and Vice-Dean for research and partner relations, Aalto University School of Science, Finland
- Daniele Vigo, Professor of Operations Research, University of Bologna, Italy
- Jean André, Applied Mathematics-Operations Research Team, Air Liquide, France
- Frédéric Gardi, VP Products, Innovation 24, President the French OR Society (ROADEF)
- Tony O'Connor CBE, Chair of the Government Operational Research Service (GORS), UK.

It was noted that a lot of collaboration is happening already, and many good examples were given. At the individual level, one and the same person can be both practitioner and academic and this offers new career paths which should be perhaps, better supported and formalised. Another interesting idea was temporal secondments of academics to practitioner teams and vice versa.

The discussion evolved around the following main topics: positive examples of collaboration; existing state and challenges in institutional collaboration; different expectations from both sides and; finally suggestions for fostering collaboration.

There were many examples of collaboration given which included government, university, industry and Society led across many countries both within Europe and outside the EU.

Universities are under pressure to show the practical impact of their research and that their research is being used by practitioners, hence there is pressure on academics to collaborate. Over the years, some of the finalists for the EURO Excellence in Practice Award have come from work done in organisations which are without their own

O.R. expertise. Many companies require non-disclosure agreements (NDAs) which can make data-sharing and publication difficult thus making collaboration unattractive to academics.

Practice is currently not recognised in the universities as a valuable academic output on a par with science and the humanities; this needs to be changed.

'The Dowling Review of Business-University Research Collaborations' raised a number of the points similar to points made during the round table sessions and serves a good examples of a formal effort to support collaboration.

Some of the main challenges mentioned included: getting objectives aligned; speed/timeliness of delivery; difficulties in communication (lack of a common language); major funders such as the EU now offer large, long-running contracts which is often counter to industry needs and; there is the question of ethics in its many guises.

Further suggestions and developments.

- Prize for collaboration;
- OR societies and EURO Working Groups should champion collaboration;
- Professional societies draft 'best practice' NDA;
- Think about ways of improving communication of research;
- 'Value/Impact of O.R.' brochure/book;
- Need to collate some guidelines and tips on successful collaboration for young academics.
- A stream in the next EURO conference or one-day colloquium/workshop;
- Academic career progression needs to be re-thought.

Many thanks to all participants and organisers.

Inspired by the EURO discussion, Simon Taylor will be running a workshop on 'Practitioner and Academic Collaborations: Getting the Best from Both Worlds' at SW16 in April. If you have any views on this or would like to get more involved in it, do please get in touch.

Biographies of panel members are available at:  
<http://www.euro2015.org/docs/default-source/default-document-library/round-tables-for-mai-website.docx?sfvrsn=0>

More on Dowling at:  
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/440927/bis\\_15\\_352\\_The\\_dowling\\_review\\_of\\_business-university\\_rearch\\_collaborations\\_2.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/440927/bis_15_352_The_dowling_review_of_business-university_rearch_collaborations_2.pdf)

A more detailed account of these discussions is being placed on the OR Society website.

## NHS supply chain

The NHS Supply Chain sustainable development report for 2014 has now been published. This report outlines NHS commitment to sustainability, places strong emphasis on minimising impact on the environment by reducing waste, procuring sustainability and building supply chain resilience.



The report also includes a section on the briefing of over 100 suppliers about requirements for labour standards assurance, and the setting of a 40% reduction goal for carbon emissions. Other achievements detailed in the report include the improvement of inbound logistics for suppliers by reducing vehicle journeys, achieving a recycling rate of 87% from business waste, and supporting Corporate Social Responsibility initiatives.

More at: <http://bit.ly/1FJNO9b>

## Computing going up

The gender gap between boys and girls taking computing at A level is diminishing, this is possibly due to the perception that a career involved with computers is likely to be a successful one irrespective of gender.



Even more encouraging is the fact that computing saw the biggest jump in entrances for A level this year, rising by

29.1% on 2014, according to figures released by the Joint Council for Qualifications (JCQ).

More at: <http://bit.ly/1hBAgHm> and <http://bit.ly/1Y6zLWO>

## Made by Robots

Under the auspices of the European program Areus, researchers at Chalmers University of Technology, in Göteborg, Sweden, say that they can cut the energy consumed by industrial robots by up to 40%. This is essentially achieved by making the robots move more slowly when to do so has no impact on the production schedule.



Robots can account for about half of all the energy used for production so any optimisation in robot-intensive manufacturing applications, such as bodywork operations in the automotive industry, is desirable.

More at: <http://bit.ly/1FbRqpz>

## You must think me mad

Diagnosing serious mental illness is still largely subjective. However a recent study over a period of two and half years has indicated that computerised analysis could be a useful diagnostic aid.



'Five out of the 34 participants in the study were known to develop psychosis within two and a half years of the initial evaluation period, as measured by separate clinically accepted criteria. The combination of predictive analytics and natural language processing used in the study correctly identified all five members of this patient group, and the results were validated with additional null hypothesis testing.'

More information can be found at: <http://bit.ly/1LH6A8E>

## Lakes and Forests

Parsa Mirhaji, MD, PhD, Associate Professor of Systems and Computational Biology and the Director of Clinical Research Informatics at the Albert Einstein College of Medicine and Montefiore Medical Center-Institute for Clinical Translational Research and Dr Jans Aasman, CEO of Franz, Inc have joined forces to create a semantic data lake.



Jans Aasman



Parsa Mirhaji

Semantic data lakes, built using graph database technology are incredibly flexible. Unlike relational databases and traditional data warehouses, data lakes do not have to be pre-planned; it is not necessary to know or anticipate the types of inquiry that users may make.

As Jennifer Bresnick, writing for HealthITAnalytics.com says, 'Data forests will continue to grow in complexity and usefulness as developers pursue the most impactful methods of using big data analytics to further strategic goals like accountable care and population health. With personalized care, predictive analytics, and tailored insights on the wish-list for the majority of healthcare providers, semantic graph databases may provide an intriguing avenue forward into the uncharted waters of data-driven, quality care.'

## Is it the real thing

A study published by INFORMS has revealed that counterfeiting goods, rather than diluting brand penetration, actually stimulates it. The study was based on 31 brands selling fashion leather and sports shoes in China over a 12-year period. During this time, counterfeit production surged due to a change in the government's enforcement policy.



Results from the study indicated that when counterfeiters fool too many customers, authentic brands step up their design game. The authentic producers make the most of their cost advantages to produce more highly differentiated goods from the counterfeits, which shoppers can easily identify as real

More at: <http://bit.ly/1OsmUtK>

## Friendly persuasion

According to research recently published in Management Science (INFORMS). A study by Ravi Bapna and Akhmed Umyarov of the Carlson School of Management at the University of Minnesota there is a 60% higher chance of someone buying an online premium service if one or more of their friends has bought it.



They also found that users with a smaller number of friends tend to be more strongly influenced than users with a larger number of friends.

More at: <http://bit.ly/1LvBhs1>

## Opalytics

Entrepreneurial Dr David Simchi Levi, MIT has launched Opalytics (short for 'operational analytics') with four packaged supply chain applications, which will also be marketed as a platform for other technology vendors and supply chain practitioners to develop their own solutions using the Opalytics tool sets.



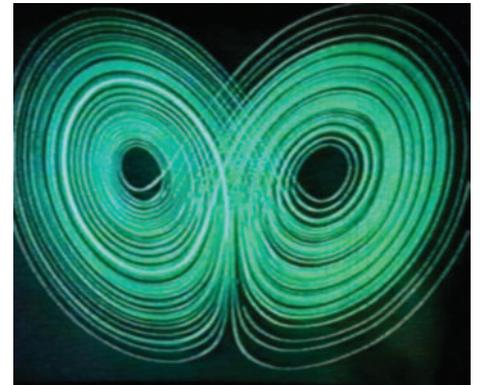
The four Opalytics applications cover: Supply Chain Network Design; Multi-Echelon Inventory Optimisation; Supply Chain Risk Management (based on Simchi-Levi's recent work developing a tool he calls the Risk Exposure Index) and; Supply Chain Segmentation tool.

A key aspect of the Opalytics segmentation solution is its use of 'machine learning' technology to continuously improve results. Opalytics is also offering a 'Cloud Platform' with packaged apps and additional developers' tools.

More at: <http://bit.ly/1NAojz4>

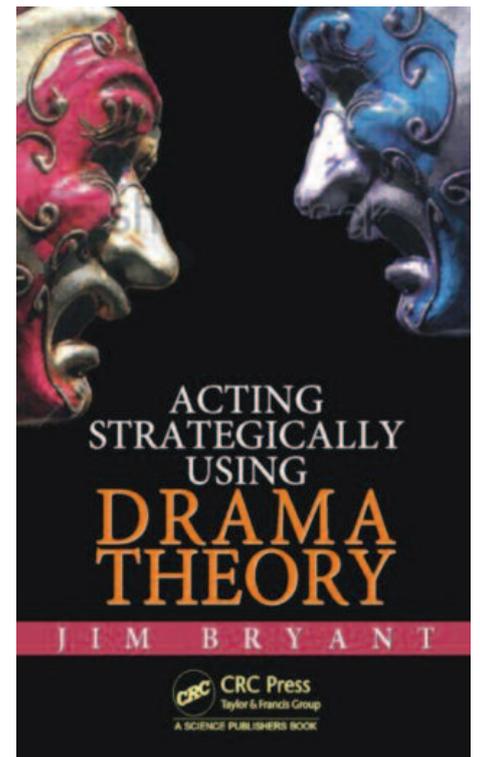
## Chaos?

Brian Hunt and Edward Ott, University of Maryland advocate a particular entropy-based definition of 'chaos' that they believe to be especially apt. The definition is based on an entropy-like quantity, which they have called 'expansion entropy'. 'Chaos' is defined as occurring when this quantity is positive.



More at: <http://bit.ly/1VXEbnb>

## All the World's a Stage



In today's confrontational and connected world, communication is the key strategic act. This book uses drama theory—a radical extension of game theory—to show how best to communicate so as to manage the emotionally charged confrontations occurring in any worthwhile relationship. Alongside a toolset that provides a systematic framework for analysing conflicts, drama theory explains why people need to listen to, and rely on, their feelings





# Blackett Memorial Lecture

The Society is pleased to announce that the 2015 Blackett Memorial Lecture will be given by

## Kenneth Cukier

Data Editor for the Economist

Kenneth Cukier is the Data Editor of The Economist in London and the co-author of the award-winning book "Big Data: A Revolution That Will Transform How We Live, Work, and Think" with Viktor Mayer-Schönberger in 2013, a New York Times Bestseller translated into 20 languages. He is a regular commentator on BBC, CNN, and NPR, and a member of the World Economic Forum's council on data-driven development. In 2002-04, Mr. Cukier was a research fellow at Harvard's Kennedy School of Government. He is a board director of International Bridges to Justice and a member of the Council on Foreign Relations.

on

**Thursday 26 November 2015**

at

**Grocers' Hall, Princes Street, London, EC2R 8AD**

[www.grocershall.co.uk](http://www.grocershall.co.uk)

Grocers' Hall is situated in the heart of the City of London in a private courtyard opposite the Bank of England. A one minute walk from Bank Station (exit 1), which is served by the Central, Circle, District and Northern Underground lines as well as the Docklands Light Railway and Waterloo and City line. Moorgate, Liverpool Street and Cannon Street British Rail stations are all just a five minute walk away.

(Title and abstract to be advised.)

**Lecture at 4.30 pm**

(Tea and biscuits at 4.00 pm; Drinks reception 6.00 – 7.00 pm, after the lecture)

**There is no charge for attendance at this event. Registration is open.**

To book online and receive joining instructions, please go to <http://www.theorsociety.com/BlackettLecture> .  
If you have any queries, please contact Hilary Wilkes on [hilary.wilkes@theorsociety.com](mailto:hilary.wilkes@theorsociety.com)

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## GOVERNMENT OPERATIONAL RESEARCHERS – WHAT DO THEY DO?

Ever wondered what it's like to work as an operational researcher in Government? Well read on to hear about the experiences of three ORs.



*Emma Frost,  
Department of Energy  
and Climate Change  
(DECC)*

As a member of the Government Operational Research Service (GORS) I've worked on a range of interesting O.R. projects, including: developing a system dynamics model to examine policy interactions in the Home Office; using

cluster analysis to categorise offenders; and modelling priority passenger queues at Heathrow using discrete event simulation.

Currently, I work in the Fuel Poverty Team within DECC. I'm developing a new simulation model to support designing the next phase of domestic energy efficiency policy, on how best to deliver energy efficiency measures to homes. This will be fundamental for achieving the statutory fuel poverty target – to get as many fuel poor homes in England as possible to a minimum energy efficiency standard of Band C by 2030.

I've also worked in DECC's Modelling Integrity Team reviewing the department's key models, including supporting the handover of a good-practice, quality assured carbon calculator for South Africa to their Department of Environmental Affairs, which involved a trip to Cape Town!

*Sam Wong, HM Revenue & Customs*

I graduated from the University of Manchester with a Physics degree. Whilst interning at a financial advisory firm I started looking for more analytical careers and found O.R.

I started my O.R. career with the Department of Work and Pensions (DWP) in Sheffield with a performance analysis team. Whilst there, I didn't



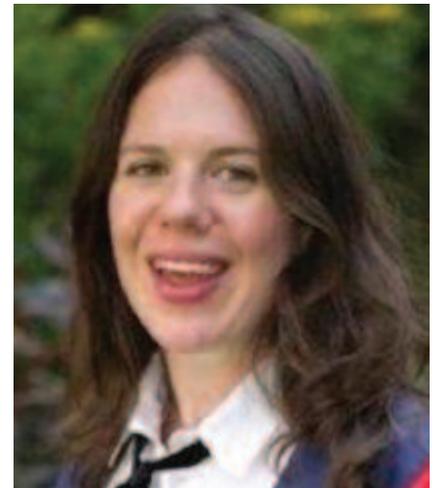
get much experience in what I'd call the more 'traditional' O.R. techniques of modelling, simulation and optimisation. Instead I worked mostly with performance measurement and statistics.

My first job was around Official Error - the error made by the Department when processing claims. I worked with sample-based performance, provided advice on sampling and sample sizes to get meaningful statistics and used bootstrapping to add further context to senior leadership teams.

I also used data matching to estimate the impact that Universal Credit will have on the operational performance of DWP's other benefits.

I've now moved to HMRC in Liverpool where I'll be working on providing analysis around the tax behaviours of SMEs.

*Sarah Livermore,  
Department of Energy  
and Climate Change*



I work in the Department of Energy and Climate Change's central modelling team. We are responsible for the development and use of key analytical models which rely on a range of O.R. techniques.

My role is to produce annual projections of the UK's energy demand and greenhouse gas emissions using an econometric model. The work is extremely varied and I collaborate with a range of stakeholders: from analysts who estimate the energy savings resulting from Government policies to colleagues in the EU who monitor the UK's performance against international targets.

Previously I worked in another GORS department: HMRC. This is a very different department in that there are 30 million direct customers – the UK taxpayers. I used systems dynamics modelling to better understand when and how customers choose to interact with HMRC so that we could focus on the most complex queries and hence improve the overall service to the taxpayer.



Central Government is the biggest business in Britain. Operational Research specialists advise Government on how to make the best possible use of public money. With their skills in problem structuring, modelling and analysis, they help formulate Government policy and find effective ways of putting it into practice.

Government OR analysts carry out the analysis that can help answer vital questions such as:

- How can we measure and improve the quality of service in education, health, benefits and other public bodies?
- How much grant will be required next year to create new jobs in industry?
- How can we compare the relative value of government expenditure on roads, health and education?

The Government Operational Research Service is the umbrella organisation that provides management support to all members across central government.

*'I would encourage anybody from a numerical background to think about a career in Operational Research. You'd be surprised how relevant your experience might be, and where it might take you.'*

## Entry Requirements

2:1 undergraduate degree in a numerate discipline *or* 2:2 with relevant work experience and/or a postgraduate qualification in an appropriate discipline.

## Starting Salaries

£24,000 - £45,000

Starting salaries will differ depending on entry level, department, location, qualifications and experience.

**Apply between 1<sup>st</sup> October and 23<sup>rd</sup> November.**

[operational-research.gov.uk](http://operational-research.gov.uk)

[civilservicejobs.service.gov.uk](http://civilservicejobs.service.gov.uk)

*'I really enjoy working for the government as an Operational Researcher. So far I've worked in two government departments (the Department of Health and the Department for Culture, Media and Sport) and I've really valued the ability to work in different settings and contribute to different types of work.'*



**GOVERNMENT OPERATIONAL RESEARCH SERVICE**





## WHAT I DID THIS SUMMER

FRANCES O'BRIEN



'I'm pleased to write that EURO had a rather diverse programme of activities, adopting some of the innovations from our own annual conferences over recent years where organisers have introduced a more varied and engaging programme.'

Would I need my old EURO umbrella, I wondered as I packed for the EURO conference recently – after all it's bound to rain in Glasgow & I still have my umbrella from the last time the EURO conference was held there in the mid 1990s... and believe it or not it still works! However despite a couple of showers, the weather held up and I didn't need an umbrella after all.

I don't know about you, but I sometimes find conferences very tiring – particularly if I've attended a whole string of 'papers' where I've listened to speakers over an extended period of time. I'm pleased to write that EURO had a rather diverse programme of activities, adopting some of the innovations from our own annual conferences over recent years where organisers have introduced a more varied and engaging programme. As I travelled up to Glasgow I wondered how such innovations would be received by the largely academic international delegate base.

For the EURO conference, a Making An Impact (MAI) team had been formed, largely from UK practitioners, to help organise a practitioner-focused series of events including speed networking, academic-practitioner bazaar and a series of workshops. Such additions to the programme meant that the conference offered many opportunities to do things other than sit and listen to people talk.

I managed to fit in participating in a speed networking event where I met a range of practitioners and academics from across Europe. For those not familiar with such an event, I can highly recommend it as it is good fun – the idea is that those participating are organised in such a way as to maximise the number of people you can meet within a set amount of time. Being organised in groups of three, each person is given 60 seconds to introduce themselves, thus in a 3 minute slot you get to here about 2 other people. They then move on and two new people take their place and so it goes on until everyone has met everyone or the time is up. Thus the whole exercise is great for practising your elevator pitch skills – not only does it help develop your own ability to succinctly describe your current work/interests but you also get to meet a whole host of people too.

Whilst I didn't manage to attend the academic-practitioner bazaar, I did get to experience the workshops, as I had volunteered to run one myself – my chosen theme was the professional identity of O.R.

practitioners and I chose a snappy title of 'Who do you think you are?' in the hope of drawing in some punters. In a packed programme with a multitude of competing parallel events, I was pleased to see around 10 people turn up for the workshop - Ruth Kaufmann gave her views on the workshop and topic in last month's leader. It's pleasing to hear that next year's EURO organisers, for the conference based in Poznan, are keen to host an MAI stream of activities.

Another aspect about conferences worthy of some note is the increasing use of supporting technology. I had pre-planned my conference schedule using the e-programme available through the EURO site so had very little need of the huge paperback volume that I was handed on arrival at the registration desk. I also had a phone app, guidebook, which I could use to help with planning my conference schedule. Whilst much of the conference was in the new TIC building, some events, notably plenaries, were in different locations, some too far for me to walk to with my arthritic hip. However technology came to the rescue again, as such events were live streamed into rooms in the more centrally located buildings.

The social side of conferences has been a relatively contentious topic within the UK O.R. community, with some being avid fans and others thinking it unnecessary. I was interested to see that many of the social events at EURO were hugely popular. The welcome drink in the TIC building on the Sunday as the conference started provided the opportunity to meet and catch up with various colleagues from other institutions and countries. The Monday evening social in Merchant Square provided similar opportunities but within a very different setting - different restaurants with varying cuisines were

located around a central area and conference goers could pick which restaurant they ate at. The Tuesday night conference banquet, held in the Science Museum, was the final social for me. The drinks reception prior to the meal provided ample opportunity to play with the different scientific exhibits - a hugely popular activity with virtually everyone having a go at multiple scientific game-based exhibits. I was surprised to find that I met someone at this last event that I hadn't bumped into earlier in the conference - not really that surprising in some ways as there were over 2000 delegates attending.

And so ended my conference season for the summer.....By the time you read this, the Young OR conference in its vacated annual conference slot for one year only will be over as will my webinar on 'Who do you think you are' - if successful this is likely to be the first of many. Over the coming 12 months we have a full programme of events planned for the Society's calendar. Our next event is the Blackett lecture in November with Kenneth Cukier, Data editor of the Economist, followed in the New Year by the Beale lecture. As for our conference programme, in December there is a joint ORS - BAM (British Academy of Management) conference on Scenario Planning at Warwick Business School. Chaired by Christine Currie and Tom Monks, SW16, the bi-annual simulation workshops runs in April at the new location of Ettington Chase. It is also running with a new format, with a selection of half-day tutorials on the first day. After an absence this year due to EURO, next year sees the return of our annual conference, OR58 which will run in its usual September slot - we are exploring venues by the sea as I write, at least that is my excuse for spending a few days on the beach.

&lt;OR&gt;

## NEWS OF MEMBERS

### The Society welcomes the following new members,

ANNA ALLEN, Surrey; MICHELLE BOWEN, Hants; RANULF CORBETT, Hants; JONATHAN DALLEY, Wilts; JULIA HANDL, Manchester; JOHN HUEMMER, USA; RACHEL SEDDON, Hants; STUART VAGG, Hants; TOMAS WESTLAKE, Hants;

### and Reinstated members,

AARON BROWN, Hants; MICHAEL COWAN, Hants; REBECCA FOX, Hants; TOM NEWMAN, Hants; KATHERINE PELOW, Hants;

### and the following student members,

ABDULWAHAB ALMUTAIRI, University Portsmouth; PUTTIPONG ANANTASPON, Brunel University; NICOLE AYIOMAMITOU, University Cardiff; MELIKE ERDOGAN, Yildiz Technical, University; REBECCA GOUGH, Loughborough University; MUHAMMET GUL, Yildiz Technical University; OLIVER HANDEL, Germany; SAM HESHMATI, Belgium; MOHAMMED IBRAHIM SHIRE, Loughborough University; RISTE ICHE, University of Ljubljana; KAVERI KALA, India; LUCY KRAFTMAN, Bristol University; MENG CHONG NG, Birkbeck

College, University London; LOUISE O'DONOVAN, University of Bristol; MITJA STIGLIC, University of Ljubljana, Faculty of Economics; TANYA REEVES, Birkbeck College, University London; FIONA ROCHE, Aberystwyth University; DANIEL UFUA, University of Hull; EIMEAR WILKINSON, Belfast; PATRICK WINTER, University Bayreuth;

**Total Membership**  
**2764**

### NEW ACCREDITEES

The Society is pleased to announce that the Accreditation Panel has admitted the following members to the categories shown. These members are now entitled to use post-nominal letters as indicated: -

**Admit to the category of FORS (Associate)**  
PAUL JENNINGS

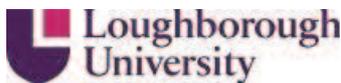
&lt;OR&gt;



# Careers Open Day 2015

## Exhibitor booking now open!

Join these organisations and help showcase the excellent opportunities available in O.R. and analytics.



**The Open Day will be held at  
Millennium Point, Birmingham  
Wednesday 18 November 2015**

**Reserve a stand for £330 +VAT**



Price includes lunch and refreshments, monthly feature in Inside O.R. up to the event and a follow up article, and a profile on our website. Confirmed exhibitors will be promoted to students prior to the event.

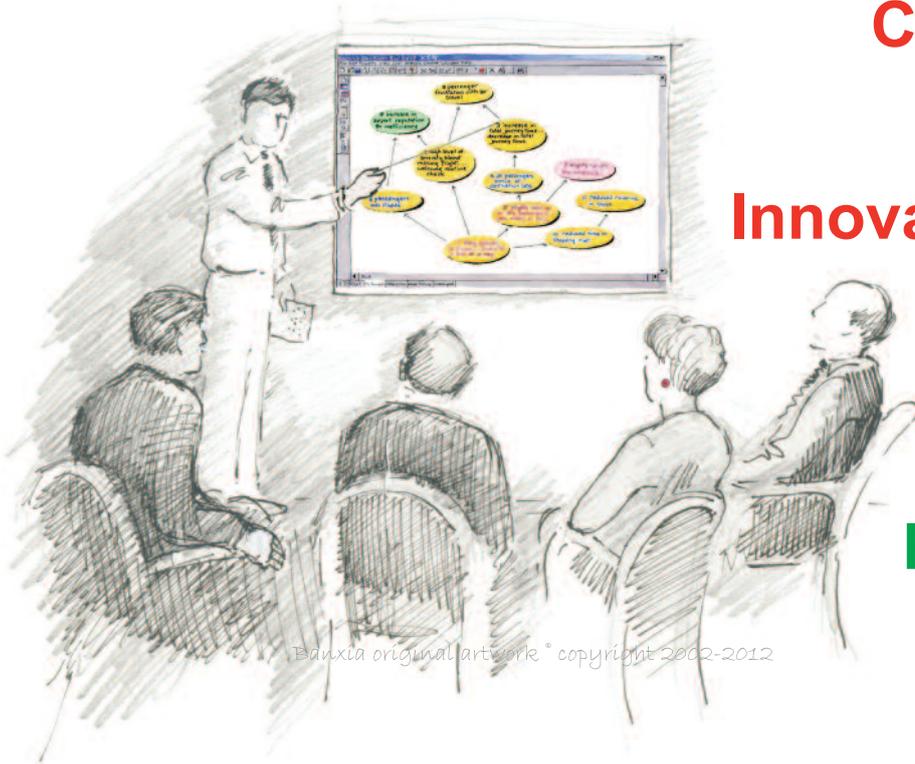
To reserve a stand please email your full contact details to Louise Allison, [louise.allison@theorsociety.com](mailto:louise.allison@theorsociety.com)

**Find out more online at  
[www.TheORSociety.com/CareersOpenDay](http://www.TheORSociety.com/CareersOpenDay)**

**Creative thinker?**

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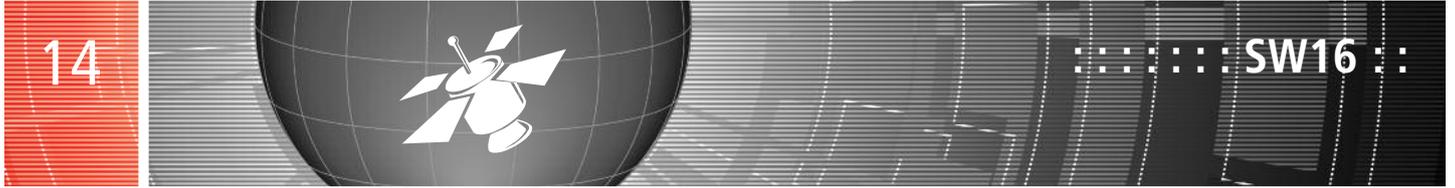
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# SW16: FOCUS ON BEGINNER AND ADVANCED TUTORIALS

**CHRISTINE CURRIE AND THOMAS MONKS**

The 8th Simulation Workshop – SW16 – is taking place next 11 – 13 April 2016. Stratford-Upon Avon, England, UK. Deadline for papers 23 October 2015.

Our upcoming conference brings with it an extra half day of beginner and advanced simulation tutorials taught by some of the leading names in simulation: Russell Cheng, John Morecroft, Stewart Robinson and Simon Taylor have all confirmed that they will be speaking. This is a fantastic opportunity for beginners and experienced modellers alike - and a great reason to come and join us.

**Professor Russell Cheng** from the University of Southampton has carried out academic research in simulation for the past 40 years and has previously given both introductory and advanced tutorials at the prestigious Winter Simulation Conference, as well as being a lecturer on the EPSRC-funded NATCOR simulation course, a national centre for the education of PhD students.

**Topic: Simulation Input Uncertainty.**

A simulation model usually depends on parameters whose values will affect its performance. For example in a single server queue, the queue length and customer waiting times depend on the customer arrival and server service rate parameters. Simulation experiments involving such a model often assume fixed, given values of these parameters. The only uncertainty is then the simulation uncertainty which is just the random variation that is built into the simulation model itself and which occurs when the model is run. Where there is uncertainty concerning parameter values, then this adds an input uncertainty that has to be taken into account in analysing simulation results.

The above approaches are based on a frequentist viewpoint. A natural alternative is to use a Bayesian formulation of input uncertainty. This has the advantage of enabling expert opinion to be incorporated into the formulation and this will also be discussed.

**Professor John Morecroft** from the London Business School and past president of the System Dynamics Society is a leading expert in strategic modelling and system dynamics, publishing numerous articles and several books in the area, including the very successful textbook *Strategic Modelling and Business Dynamics*. **Topic: System Dynamics and Enduring Feedback Structure in Love and Supply Chains.**

In this tutorial John will introduce system dynamics modelling and simulation with a selection of well-known models that examine feedback structure and system performance. The models span a range of topics from Romeo and Juliet to manufacturing firms and supply chains. He will review the feedback structure of the models and the dynamics that arise from different ways of coordinating operations and asset stocks. Participants then use a variety of pre-built simulators to test and explore such coordination dynamics for themselves. He will demonstrate an approach to model analysis that combines visualisation and simulation with non-technical narrative interpretation of simulations. The approach yields intuitively appealing insight into performance paradoxes to help modellers (and executives) identify practical policy changes that improve functional coordination and overall firm performance.

**Professor Stewart Robinson** from the University of Loughborough is President of the OR Society and the author of one of the key texts in simulation, *Simulation: the Practice of Model Development and Use*. Like Russell, he is also a lecturer on the NATCOR simulation course.

**Topic: Conceptual Modelling for Simulation.**

Conceptual modelling is the abstraction of a simulation model from the part of the real world it is representing; in other words, choosing what to model, and what not to model. This is generally agreed to

‘Our upcoming conference brings with it an extra half day of beginner and advanced simulation tutorials taught by some of the leading names in simulation.’





# Learning and Development Programme

## OR Society Approved Training Courses

### USING SOFT SYSTEMS METHODOLOGY

**30 September, Birmingham**  
**£550 + VAT** for OR Society members  
**Course provider:** Mark Westcombe

This is a practical course aimed at developing expertise in applying Soft Systems Methodology (SSM). We look at the application of SSM for problem structuring within complex projects, and how to use the approach for planning the project process.

The practical skills of applying SSM; Using SSM for thinking about and planning projects; The importance of process and process facilitation; Using SSM models to improve dialogue and decision making; Direct application of SSM in the delegate's workplace

### PRACTICING SOFT SYSTEMS METHODOLOGY

**1 October, Birmingham**  
**£550 + VAT** for OR Society members  
**Course provider:** Mark Westcombe

This is a practical course aimed at furthering expertise and confidence in the use of Soft Systems Methodology (SSM). The course develops the skills learnt in the 'Using Soft Systems Methodology' course [see above] and it may be combined to form a two-day programme. Alternatively, it can be used as a stand-alone day to refresh skills or to gain feedback on using SSM.

Further practice in the application of SSM techniques; Enhanced understanding of the use of SSM in practical situations; Guidance on using SSM techniques with delegates' own work based problems; Discuss application of SSM in the workplace; Gain expert feedback on your use of SSM

### INTRODUCING SOCIAL MEDIA FOR RESEARCHERS AND CONSULTANTS

**6 October, Birmingham**  
**£400 + VAT** for OR Society members  
**Hands on course**  
**Course provider:** Francisco Marco-Serrano

Most social media training courses provide a basic general introduction to the subject and then you're left on your own to see how you can put it into action. This course provides a sound understanding of the concept of social media, learn how to choose which social networks to join and which benefits you can get from social media. You'll also get expert advice on how to create your own social media marketing campaigns and help with planning an individual social media strategy.

You'll get started with your presence in social media; Connect and interact with peers in digital social networks; Enhance your marketing through social media campaigns

### ESSENTIAL O.R. SKILLS FOR PRACTITIONERS

**7 October, Birmingham**  
**£485 + VAT** for OR Society members  
**Hands on course**  
**Course providers:**  
David Halsall and Louise Plewes

This course is for analytical practitioners who want to increase the impact of their work by learning about O.R. techniques which have a proven track record of working in real world situations and finding about some of the tricks of the trade.

You'll learn about the policy development / monitoring/ evaluation cycle, gain an overview of problem structuring techniques to shape requests for analysis and get to grips with the basics of using excel spreadsheet modelling to underpin robust and traceable analysis. You'll get an overview of discrete event simulation and its role in what-if analysis as well as data presentation methods to achieve high impact from analysis.

Chance to discuss case studies and areas of concern in a safe environment; Highly relevant current topics covered in the day reflecting the current economic environment that most practitioners work in; New area of course provision to fill the gap between formal O.R. routes into the profession and those coming from an analytics/IT background

### DATA MINING: TECHNIQUES AND APPLICATIONS

**15 October, Birmingham NEW DATE**  
**£665 + VAT** for OR Society members  
**Hands on course**  
**Course providers:**  
Bart Baesens and David Martens

Gain an overview of the data mining process and learn about predictive analyses such as regression and classification. Build your own decision models and see how to use data mining techniques in a range of applications such as marketing, finance and the public sector.

Developing predictive models using classification and regression, Decision trees, Logistic regression, Artificial Neural Networks; Evaluating predictive models; Applications in marketing, finance and risk management; Developing descriptive models using clustering and association rules; Apriori algorithm, k-means clustering; Lab exercises with Weka

### DATA MINING: ADVANCED DATA MINING

**16 October, Birmingham NEW DATE**  
**£665 + VAT** for OR Society members  
**Hands on course**  
**Course providers:**  
Bart Baesens and David Martens

Developing skills learnt from the Techniques and Applications course [see above]

State-of-the-art techniques in data mining: Support Vector Machines; Bayesian Networks; Rule Extraction; Text Mining Recommender Systems; Social Network Analysis (SNA): Principles of SNA; Mining Networked data; Applications in advertising, fraud detection and customer analytics; Big Data: Principles of Big Data; The mapReduce paradigm; Mining Big Data; Applications in government and marketing; The Black Swan

## FOUNDATIONS OF O.R.: LINEAR PROGRAMMING

20 October, Oxford Street, London  
£575 + VAT for OR Society members

**NEW FOR 2015**

Course provider: Victor Podinovski

Many complex real-life decision problems involve some form of optimisation of the use of resources, production profiles, services, schedules, investment decisions and so on. Depending on the task, different optimisation approaches have been developed in the field of OR to address these needs.

This session looks primarily into linear programming, which is the most commonly used optimisation methodology. We also briefly discuss several other optimisation techniques. The focus of this session is on the modelling side of linear programming and practical solution of LP models.

The topics covered during the day are: Linear programming models, objective functions, constraints; Assumptions (simplifications) accepted in LP; Using Excel Solver to solve an LP; Interpretation of the optimal solution, sensitivity analysis; Other optimisation techniques, including heuristic methodologies.

## THE SCIENCE OF DATA VISUALISATION

20 October, Birmingham **EXTRA DATE**  
£615 + VAT for OR Society members  
Hands on course

Course provider: Ian Taylor

These days, we can all create charts with one click. It's easy - so why do they sometimes look so wrong? It turns out that we must respect ten thousand years of evolution, learn a new language, get to grips with core components and apply a structured process! During the day we will mix presentation, video, real published examples and workshop exercises to equip you for the exciting adventure that is modern data visualisation.

You will learn: How visuals are hardwired into our biology; Why some charts elucidate and some obfuscate; The six simple steps in the visualisation cycle; How to transform your interaction with decision makers; Why action must flow from every successful visualisation

## ACTIONABLE INTELLIGENCE

21 October, Birmingham **NEW DATE**  
£555 + VAT for OR Society members

**NEW FOR 2015**

Course provider: Ian Taylor

With the government now more committed than ever to increasing open-data sets and the growing presence of Big Data, there is increasing opportunity for organisations to establish a more data-driven decision-making process. Being equipped with the knowledge of how to extract maximum value from this information, organisations can transform the way they function – improving efficiency and effectiveness and creating a more evidenced based data culture across the organisation.

Actionable Intelligence will equip you with the strategies necessary for implementing effective, data-driven decision-making processes that improve the functioning of your organisation. Meeting the challenges posed by Big Data and utilising data to drive outcomes, this course will enable you to make informed, evidenced-based business decisions.

Make informed business decisions and design services through the effective use of data; Use Key Performance Indicators (KPI) to drive outcomes; Improve outcomes for service-users by improving efficiency and effectiveness; Establish an actionable intelligence culture within your organisation; Utilise data visualisation to create data driven decisions

## FROM BIG DATA TO OPEN DATA

22 October, Birmingham **NEW DATE**  
£555 + VAT for OR Society members

**NEW FOR 2015**

Course provider: Ian Taylor

Big Data and Open Data will prove to be a game changer for those organisations that ignore the hype and use these advances to enrich the data ecosystems they currently use. As data specialists moving from the structured data world to the use of semi structured, unstructured and open data requires a new understanding of the landscape before we can begin to gain the value from these innovations.

From Big Data to Open Data will explain the strategic landscape of both new data areas, enabling you to assess how best to incorporate both to create new strategies. Exploring the use of these new data sources will prepare an organisation to move from an analogue data view of their data to a digitally enabled view.

This course will enable organisations to understand the challenges and opportunities posed by Big Data and Open Data. What is Big Data and why does it matter; What is Open Data and why is it important; The challenges and opportunities of moving to a digital data landscape; Learn about some case studies which have particularly added value to the organisation; Next steps and innovations in this new data landscape

**ALSO THIS OCTOBER: 27<sup>th</sup>: PRACTICAL PROCESS IMPROVEMENT USING LEAN AND 6-SIGMA AND 29<sup>th</sup>: MANAGING SUCCESSFUL ANALYTICAL PROJECTS [28 OCTOBER]**

**For details of all courses and to book online, visit [www.theorsociety.com](http://www.theorsociety.com) or call Jennie Phelps on 0121 234 7818**



## ANALYTICS WITH EVERYTHING

**NIGEL CUMMINGS**

Computing power and the range of available datasets has increased so much in recent years that we can now make business decisions automatically based on hard evidence and not instinct.

Three companies, Pizza hut, Subway and KFC, in the casual dining market have recently applied evidence-based reasoning via analytics to improving their businesses.

Considering that Pizza Hut has a chain of around 250 restaurants in the UK and each of its restaurant is capable of entertaining between 1000 and 2000 customers a week, this has made a significant improvement on profits.

The Subway chain succeeded because of its famously simple idea of selling a foot-long sandwich for five US dollars, around £3 even though this was at a loss for some of its fillings. Analytics has revealed that more people come to buy other such as high profit crisps, drinks and sweets to accompany the sandwiches.



The look and feel of Pizza Hut restaurants had fallen behind the times, the menus were less exciting than their competitors, they were in actual fact, just a little too focused on pizzas. Pizza Hut employed the services of Applied Predictive Technologies (APT) to run 'control experiments' on other establishments that showed similar behaviours as a baseline. The data was analysed to get to the truth of what did and what did not promote casual dining experiences.



KFC has also been losing market share, in particular with young women. Analytics and perceptual marketing has helped the company see that young women saw the KFC brand as a 'guilty pleasure' and not a 'staple food'. To recapture this sector, KFC has added 'lighter options' to its menu.

KFC analysed its market carefully and came to the conclusion that its brand had to be associated with promoting health, if young women want to go to the gym to keep fit, they should be given the opportunity to buy food that would sustain them sufficiently, healthily and provide an 'element' of guilty pleasure too – all this without making them fat. All this and clever advertising has helped increase their sales to young women by 29%

In the era of data analytics, companies like KFC, Subway and Pizza Hut have realised that 'knowing' your customers and reacting according to their needs is what it is all about!

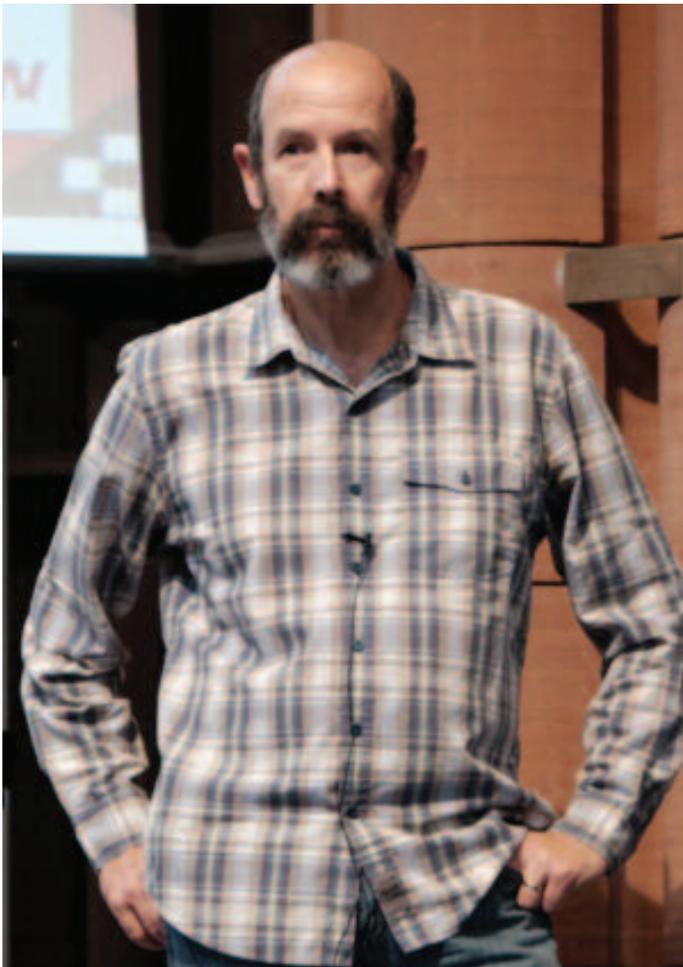


The application of such analytics allowed Pizza Hut to refine its brand so much so that according to Mr Platt. 'We saw a 40% growth in some of our really big investments, which was truly transformational. Before we started average customer spend was around £9, now it is around £11 per head.'

# MARTIN SAVELSBERGH - ADVANCES IN CRITERION SPACE SEARCH METHODS FOR MULTIOBJECTIVE MIXED INTEGER PROGRAMMING

**NIGEL CUMMINGS**

Martin Savelsbergh began his keynote lecture at EURO2015 by talking about his specialty - multi-objective mixed integer programming (MOMIP), a branch of mathematics he said he had, been working on for the past four years.



Motivation wise the topic of Criterion Space Search (CSS) Methods was a good one, because there was now an increasing number of adopters of optimisation-based decision support tools in industry and government (often embedding CPLEX, Gurobi, or Xpress-Optimiser).

CSS was a computationally exacting process, but computer power was available cheaply today, so it was quite practical to apply MOMIP. Surveys on MOO in engineering economics and finance had revealed increasing use of the technique in recent times.

The solution approaches he intended to speak about were purpose-built branch and bound algorithms. In particular the use of CSS methods such as repeated solution of single objective integer programs (scalisation method). These included a balanced box splitting method where the solution space could be cut into rectangles or boxes to isolate individual or multiple elements for analysis. Such isolation techniques assisted in reducing unexplored areas in the criterion space by at least 50%.

It is also possible to exploit features of single objective optimisations and speed up algorithms considerably by exploiting already discovered feasible solutions i.e. 'algorithm engineering.' Solution harvesting, a method to collect multiple feasible solutions, can also increase efficiency.

It was also possible to apply a 'triangle splitting method', which alternated between processing rectangles and triangles. This method is recursive and searching could take place efficiently along the hypotenuses of triangles generated.

Martin Savelsbergh's talk became even more technical and complex as he delved into 3D spaces with three objective optimisations operating.

Current and future research included parallel implementations where algorithms naturally parallelised, and the exploration of different projections, which may not necessarily be faster but could be more efficient overall.

Work was he said, ongoing with regard to investigating whether it was possible to optimise linear functions over already discovered sets of efficient solutions. To 'handle' more than three objective functions, and to exploit the properties of objective functions (in conflict or in alignment) to reduce the overall number of objective functions.

## POPULARITY. THE LONG AND SHORT OF IT.

**NIGEL CUMMINGS**

The August 2015 issue of the Journal Royal Society Open Science published a paper which claims that it might be possible to predict the popularity of a scientific paper from the length of its title. Apparently the lesson learned from this research is, 'the shorter the title, the more attention the paper gets'. Read on to discover more...



*Doctor Adrian Letchford*

The research indicates that papers with short titles tend to get cited more often than those with longer ones, and the evidence for this has been acquired from research which examined 140,000 papers published between 2007 and 2013.

The research relied upon 'citation counting' to judge intensity of attention for papers because citations are a key indicator in academia - the number of times other researchers cite a scientist's work is regarded as an important metric in hiring and workplace evaluation. Citations also, it is acknowledged, provide an extra impact factor because they also help to increase the number of times a paper may be published in 'leading' journals.

Understanding citation rates however is difficult, many attempts have been done so in the past to find out just exactly what the factors are that influence citation rate. One of the problems associated with such analysis is that citations can take considerable periods of time, sometimes years, to accumulate

The authors of this most recent study took this factor into

consideration during their analysis. They used the Scopus database to examine the titles of the 20,000 most cited papers in each year from 2007 to 2013. For papers published during the period 2007 and 2008, the link between shorter titles and higher citation numbers was seen as strong, but the link became weaker for papers published in 2012 and 2013, which had less time to accumulate citations.

Those differences became less stark however when the researchers looked at citation totals for entire journals, and not just individual papers. In general, they found that journals that published papers with shorter titles received more citations per year.

There were however anomalies revealed by the search, there were for example, exceptions in medical journals like The Lancet and The Lancet Oncology. Research papers in those publications tended to acquire high citation numbers despite publishing longer titles, yet the Journal of High Energy Physics accumulated few citations despite using shorter titles.

According to Doctor Adrian Letchford, a data scientist and lead author of the research, at the University of Warwick in Coventry, 'My working theory is that perhaps shorter paper titles are easier to read and easier to understand, thus attracting wider audiences and increasing the likelihood of a citation'.

He added to that statement though, by saying there may be other explanations. One could be an effect that high-impact journals tend to have, due to their being known to attract higher citation numbers - such journals may restrict title lengths more strictly than lesser publications. Another explanation might be that research outlining 'incremental' advances may be published with longer titles in 'less prestigious' journals, which receive fewer citations anyway.

In qualifying the findings of this research concerning short versus long titles, a striking example of the short versus long title argument was highlighted by Letchford. It concerned four papers published in 2010 in Science (the parent publication of ScienceInsider).

Two of the papers with among the longest titles found in the journal that year, 'The role of particle morphology in interfacial energy transfer in CDSE/CDS heterostructure nanocrystals' and 'Insects betray themselves in nature to predators by rapid isomerization of green leaf volatiles,' had 68 and 67 citations respectively.



# COURAGE AND INTEGRITY – THE RELATIONSHIP BETWEEN ANALYST AND DECISION MAKER

**NOEL CORRIGAN, CORDA**

Air Marshal Phil Osborn CBE RAF, the UK MOD's Chief of Defence Intelligence, provided the keynote for the 32nd International Symposium on Military Operational Research, setting a challenge for analysts to address the future requirements for decision support.

32 ISMOR was honoured to be addressed not only by the Chief of Defence Intelligence, but also by the President of the Institute of Physics, Dr Frances Saunders CB FREng FInstP. Between these two addresses the conference attendees were treated to thirty papers, and a variety of posters, workshops and tutorials over the course of four days. Nearly 100 delegates came from a dozen countries including Australia, Canada, Israel and the USA. These included representatives from national ministries of defence, industry and academia.



*Air Marshal Phil Osborn*

The Air Marshal laid out his challenge to analysts to 'challenge the biases' of the decision makers, and to ensure that the central role of the human (and their behaviours) is reflected both in the analysis and the way the analysis is communicated. He noted that with the increasing ubiquity of data the role of analysis is shifting from generating information to generating knowledge. Our

future advantage (our asymmetric edge) will be how we use this knowledge to support better decisions, and this needs a closer, more integrated relationship between analyst and decision-maker.

Frances Saunders is a former Chief Executive of the Defence Science and Technical Laboratory. She majored on the theme of making an impact. She noted that Impact should be built into the earliest thinking about a study – whether that just be to increase insights from new knowledge or to deliver additional economic and operational benefits. Her concern was with quantifying the benefits



*Frances Saunders*

of decision support – can you really say that a better decision was taken as a result of analysis conducted, or solely that the decision making was better informed?

She warned that, it is difficult for long term strategic analysis to achieve impact because of the lack of clear and continuing ownership of problems that would be illuminated by such analysis. And that users of the results of analysis really do not care how clever the analyst is, nor do they care how clever or novel the analytical technique is – they are only interested in what the results will do for them.

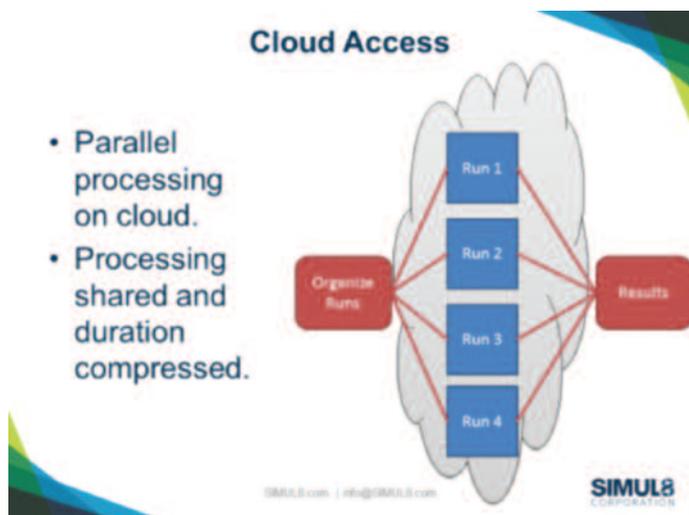
In conclusion, she noted that analysts should think about maximising Impact at the design stage of any piece of analysis – particularly talking to the users about their expectations. Further, analysts must capture case studies of where analysis has had a demonstrable impact: follow up the audit trail of where it really helped with difficult choices or saved money. And finally, she implored us to remember that analysis is a contact sport – it will only have impact if users are fully engaged. It is not best delivered by specialists sat in backrooms throwing multisided dice or running complex models that only they understand.

Highlights from the presented papers included a study of bed requirements for healthcare workers during the Ebola crisis in Sierra Leone, presented by Jordan Low from Dstl. This work successfully addressed the problem of (lack of) data quality, and had a clear and





he had been heavily involved with the US Department of Energy. The department had been trying to prioritise 140 R&D projects to support nuclear clean-up yet fit within the budget of \$120m. Ian had successfully used MCDA for the project and had developed a hierarchy of objectives. He said that it had been very hard to identify objectives despite there being a mission and vision in place: some people didn't know what had been published; others didn't understand them or how to measure them and; there were differences of opinion between stakeholders. He advised the audience that in these cases it was often necessary to run through a strategy development session with the Lead team. The lessons Ian had learned included: experts aren't experts on things outside their expertise; scores are a matter of opinion, not fact; workshops are subject to group-think; it is important to carry out peer review and validate data; use expert workshops to investigate the data but not to 'score'; more people generally means 'more difficult'.



Liam Hastie from Simul8, talked about **Using Simulation and Cloud Based Computing to bring Optimisation to SMEs**. Liam gave an example of a collaboration project with a small company that produces die cutting tools which needed to optimise its output to meet demand. Simulations to do this could require a great deal of processing time not available to small companies so the intention was to build a simulation that links to the Cloud to achieve faster processing time. He raised the question of how the Cloud is going to develop – will it offer new approaches, like running processor intensive analysis via mobile phones? Watch this space!

The Analytics session illustrated a range of applications from members of the UK O.R. community, confirming the strong overlap of the two disciplines. Martin Slaughter, Hartley McMaster Ltd showed how **Using Retail Sales Data to Realign Store Trading Hours** could identify the most profitable opening hours for Vodafone UK's 300+ stores. Large data sets measuring footfall in stores and sales profiles were used to correlate customer arrival patterns with sales activity and to develop tools to identify revised store trading hours. The store hours of virtually all shops were altered in line with the model recommendations. The trading performance was reviewed 12 months later and trading performance had improved as predicted.

John Albiston described how **The Use of Process Mining in the Steel Industry** is helping TATA Steel to gain better insights into the flow of material through the various steel making activities. The group used the process mining 'massive open online course' (MOOC) from Eindhoven University to learn about it and then carry out this pilot project. The overall aim is to deliver the correct product on time to the customer but variations in steel making processes mean that this is difficult to achieve in practice. Existing approaches such as 'make to stock' and 'finish to order' help but not completely. This pilot project using process mining is enabling a greater understanding of the process variabilities, thus leading to improved overall performance.



Colin Stewart of Caversham Analytics described his **Experiences with Developing a Data Product for Life and Pensions Firms**. The aim was to develop a post code based mortality risk model for insurers offering life and pension products. Much open source data was accessed to ensure that the model was of the required accuracy and potential users collaborated in the design and testing of the final product which will now be marketed. Having the right team in place was seen as essential for providing credibility to potential users.

Paul Edkins, DecisionLab, ended the session by posing an interesting question: - **Optimisation Projects: When should Pragmatism trump Optimality?** The context was a power company's assets – when should assets be replaced/refurbished so as to minimise the risk of failure? A mixed-integer LP model was developed to minimise the risk of failure, subject to budget constraints, and provided acceptable results for subsets of the asset portfolio but computational times for the full asset portfolio proved to be too long. Moreover, it was difficult to incorporate some of the practicalities and beliefs of the asset managers. A rule-based heuristic is being investigated as being more acceptable to the client but will not produce optimal results. In discussion it was suggested that a comparison of the results of the MIP and the heuristic for subsets of the asset portfolio would demonstrate the effectiveness of the heuristic.

**Many conferences, including this one, schedule 4 talks in each 90-minute session, which equates to around 20 minutes for the talk and just a couple of minutes for discussion. This suits academics, who are able to develop networks to enable critical peer review of their work. Practitioners, on the other hand, might be seeking feedback on the methods they are using but insufficient time is available in this format - but the academic-practitioner poster sessions, also running at this conference, do provide this opportunity. However, as far as the audiences were concerned, this stream provided a wide range of interesting O.R. case studies that had made a difference, demonstrating once again that that O.R. practice is alive and well!**

**We are most grateful to all our speakers for making the sessions so interesting and to all the members of the audience who joined in with enthusiastic questions and comments.**

# SPECIAL INTEREST GROUPS

## CRIMINAL JUSTICE

**CONTACT:** Ian Newsome

**TEL. DDI:** 01924 292244 **Extension:** 22244

**EMAIL:** ian.newsome@westyorkshire.pnn.police.uk

### CJ sig Autumn meeting

**Date/Time:** Wednesday, 18 November 2015 @13.30 - 16.30

**Venue:** NUT, London near Kings Cross/Euston

**Speaker:** See below

We have a range of most interesting speakers lined up for you including: Jacqui Taylor from Flying Binary, Jane Parkin from Carr House Consulting, Larry Phillips from LSE and David Wrigley from Orvis Consulting.

Jacqui has 25 years' experience of deploying technology change, including an appointment in the Cabinet Office as an independent Ministerial Adviser and an Open Data domain expert. She will outline a recent project for NHS England where her company as core technology suppliers deployed their Smart City data platforms as part of the NHS Citizen project. Jacqui will also suggest how these developments might be useful to the CJ community.

Jane, who is a member of the ORS Board and of Jigsaw Consultants, has recently done some research and project work on 'Well-being' measures for comparing the effect of different rosters on staff and will describe these measures to us.

As well as an Emeritus Professor at the LSE and a Director and founder of Facilitations Ltd., Larry is known by many of us in particular for his expertise in decision conferencing. He will talk to us about his extensive work on modelling the harm of drugs for the UK and EU.

David, who is also a member of Jigsaw, will describe to us his recent work for a government agency on optimising rosters.

Further info will be posted here as soon as possible. Contact suemerchant@hotmail.com for further details.

We look forward to seeing you there!

## DECISION ANALYSIS

**CONTACT:** Nadia Papamichail

**TEL:** 0161 275 6539

**EMAIL:** nadia.papamichail@mbs.ac.uk

### Bridging the gap between analysis and implementation

**Date/Time:** Friday 16 October 2015 10:00am – 4pm

**Venue:** Dstl Portsdown West (PO17 6AD)

Are you an O.R. practitioner who has overcome challenges in

getting your findings adopted? Or an academic who also has insights to share? Then this event is for you!

The Behavioural O.R., Decision Analysis, Defence and Public Policy Design SIGs are holding a joint event focussed on 'Bridging the gap between analysis and implementation'. The aims for the event are to identify common success factors for the ready exploitation of analysis products and to identify knowledge gaps that should be addressed through research.

Please register your interest in participating and let us know if you would be willing to deliver a short presentation during the event - the organising committee are keen to represent a wide range of academic, industrial and government perspectives.

Event Committee

POC: David Lowe - david.lowe(at)dstl.gov.uk

Please register your interest with an email to Peter Miles – petermiles(at)catalyzeconsulting.com

## O.R. AND STRATEGY

**CONTACT:** Frances O'Brien

**TEL:** 02476 522095

**EMAIL:** Frances.O'Brien@wbs.ac.uk

### SCENARIO 2015: Improving Scenario Methodology; Theory and Practice

**Date/Time:** Monday 14 – Tuesday 15 December 2015 09.00-16.00

**Venue:** Warwick Business School, Coventry, West Midlands, CV4 7AL

This two day event will feature presentations and discussion about latest developments in academic research and practice relating to scenario analysis. It will feature speakers from a number of leading corporate practitioners of strategic foresight, as well as top academic researchers in this field.

One such speaker will be Professor Peter McKiernan, Dean of the Faculty of Management and Governance at Murdoch University in Perth (WA) and Professor of Management at Strathclyde Business School, Glasgow, Scotland.

Call for Papers for a special issue of the journal 'Technological Forecasting and Social Change'.

Return to the O.R. & Strategy SIG Home page - Recent Blog Posts section - for more information

Please note: the start and end times are to be confirmed



## REGIONAL SOCIETIES

### LONDON & SOUTH EAST (LASE OR S)

**CONTACT:**

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**'What's so special about the Third Sector?'**

**Date/Time:** Tuesday 13th October, 6.00pm (for 6:30pm start)

**Speaker:** Ruth Kaufman - President Elect, The OR Society

The OR Society's Third Sector initiative has two main components: a Special Interest Group, and a Pro Bono scheme, matching O.R. volunteers with third sector organisations needing their input. But is there really any difference between doing O.R. in the third sector and doing it with a government or private sector organisation? Is 'it's for charity' really a good enough reason to work for free? This talk explores these challenges, taking charities as an example of third sector organisations.

**'O.R. in the Age of Big Data'**

**Date/Time:** Wednesday 11th November, 6.00pm (for 6:30pm start)

**Speaker:** Stewart Robinson - President of the Operational Research Society & Professor of Management Science, Loughborough University

What does 'big data' mean for O.R.? For many O.R. workers our education was founded on 'small data' techniques. This carried over into our O.R. practice, where we were pleased if we could find reasonable samples of data to support our models. Big data may be changing all of that. In this talk we shall explore how big data could impact on our models and our modelling practice. In doing so we shall try and answer the following questions: What is big data? How does the world of O.R. fit with the world of big data, analytics and data science? What role might big data play in our modelling efforts? And, does big data challenge our very conception of the 'O.R. methodology'?

**Location (unless otherwise specified):** In the upstairs bar of Ye Olde Watling, on the Corner of Bow Lane and Watling Street nearest stations are Mansion House (Bow Lane exit) and Bank (exit 8) for tube, or Cannon Street and City Thameslink for rail. The event is open to all and with a free buffet of sandwiches available afterwards.

For further details contact:

Sandra Weddell Tel: 020 3054 8693,

Email: Sandra.Weddell@tube.tfl.gov.uk

### MIDLAND (MORS)

**CONTACT:** Jen East (Secretary)

**EMAIL:** MidlandsORSociety@live.co.uk

**Using Systems Thinking to Undertake a Review of Child Protection in England**

**Date/Time:** Wednesday, 14 October 2015 18.00-19.00

**Venue:** Aston University

**Speakers:** David Lane

The work formed a central part of 'the Munro Review' (Munro, 2010, 2011a, b), a high-profile review of state-managed child protection activities in England, conducted for the Department for Education.

Child protection in England encompasses a wide range of services which aim to secure the safety and welfare of children and young people. This includes, for example, the provision of foster care and adoption services, and support for families. The child protection system is also responsible for the investigation of possible cases of child maltreatment, and intervention in such cases.

Drawing on the field of system dynamics, causal loop diagramming was used to map the sector. Among the evidence used in support of the map were published research, expert interviews, and comments from relevant professions (e.g. health, social work, judiciary). This systems mapping unearthed a prescriptive approach to child protection that contributed to a culture of a compliance.

A second phase of work used group model building to examine the functioning of the sector. A group of professionals and experts worked over a number of sessions and created a large and complex systems map of current operations. By considering the causal mechanisms that were in operation, it became apparent that the sector was in the grip of a set of reinforcing effects, or 'vicious circles'. The map was subsequently used to give structure to the issues the review had to address and ultimately provided an organising framework for the recommendations that were made. Of the 15 recommendations in the report, ten were accepted in full and five were accepted in principle.

Using systems thinking and causal loop diagrams the work addressed a vital area of public policy and it had a major influence on the recommendations of the Munro Review. That influence continues through on-going changes in government policy for child protection.

The work was therefore judged a worthy winner of the President's Medal for 2014.

**References**

Munro, E. 2010. *The Munro Review of Child Protection Part One: A Systems Analysis*. TSO: London.

Munro, E. 2011a. *The Munro Review of Child Protection Interim Report: The Child's Journey*. TSO: London.

Munro, E. 2011b. *The Munro Review of Child Protection Final Report: A child-centred system*. TSO: London.

**What's so special about the Third Sector?**

**Date/Time:** Wednesday 11 November 2015

**Venue:** Aston University

**Speakers:** Ruth Kaufman

The OR Society's Third Sector initiative has two main components: a





# SOCIAL MEDIA MONTHLY FAVOURITES



**What's hot on Twitter from @TheORSociety community of 1,673 followers...**

<p><b>National Nuclear Lab</b> @UKNNL Sep 11                  @UKNNL &amp; @DECCgovuk are co-chairing this year's Energy &amp; Climate Change Stream at #YOR19. Details at <a href="http://bit.ly/yor19">http://bit.ly/yor19</a> @TheORSociety</p>	<p><b>Fredrik Odegaard</b> @CORS_President Sep 11 just became aware that student membership to the @TheORSociety is free.</p>	<p><b>Ian J Seath</b> @IanJSeath Sep 10                  What's so special about the Third Sector?  <a href="http://buff.ly/1O3njDH">http://buff.ly/1O3njDH</a> @TheORSociety</p>
<p><b>John Whittaker</b> @johnwhittaker Sep 8                  @drvinceknight @TheORSociety @BritSciAssoc ask @TheTonyO why trains often close their doors 2 minutes before departure.</p>		<p><b>Graham Sharp</b> @sharpresearch Sep 7 @theorsociety Delighted that the O.R. Team won Only Connect on BBC2 tonight. Good luck in the next round! <a href="http://pic.twitter.com/IQpZEr1OBU">pic.twitter.com/IQpZEr1OBU</a></p>
<p><b>tom monks</b> @tommonks1 Sep 2                  @TheORSociety have I mentioned that the UK simulation workshop is being 11th-13th Apr *2016* recently? <a href="http://goo.gl/uzS7HU">http://goo.gl/uzS7HU</a> #ThisIsOR</p>	<p><b>Ehsan Khodabandeh</b> @EhsanKhoda Sep 13                  I solved a problem and now I'm stuck with how to derive the meaningful results! moral of story ALWAYS plan backwards! #facepalM #ThisIsOR</p>	<p><b>Laura Bianchi</b> @LauraBianki Sep 15                  MSF looks for an operational research officer in Brussels/Luxembourg! Great team, interesting job, innovative field: <a href="http://www.msf-azg.be/fr/emploi/travailler-pour-msf/operational-research-documentation-support-mf...">http://www.msf-azg.be/fr/emploi/travailler-pour-msf/operational-research-documentation-support-mf ...</a></p>

**Who the OR Society is following on twitter:**

 <p><b>Nicola</b> @Nicola_BeCareer                  Founder of <a href="http://becareerdriven.com">http://becareerdriven.com</a>                  HR Director @ SIMUL8 Corporation and crazy F1 fan!</p>	 <p><b>Will Usher</b>                  @willu47                  I research into the future of the UK energy system. I am into cycling and rock climbing. I also tweet as @playwood_co.</p>
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**The OR Society on LinkedIn: join the 3,530 members who do so ...**



**Frances Sneddon** CTO at SIMUL8 Corporation

**Live Webinar - Managing Bed Capacity Towards a Solution**



Frances posts about a webinar on how to prevent delays and ED boarding time, reduce length of stay, and ensure patients get the best care. Frances notes that inpatient stays are one of the most expensive areas of healthcare and managing bed capacity is a daily challenge for hospital administrators. The webinar will address: How can we more effectively manage hospital bed occupancy?

The Webinar takes place on Thursday 27<sup>th</sup>, see the link below for details: <http://www.simul8healthcare.com/bed-management-workshop>

**Why not join us on Twitter, LinkedIn or Facebook? [www.theorsociety.com/FollowUs](http://www.theorsociety.com/FollowUs)  
 Get tweeting and posting: Your contribution might be featured next...**



# DATA VISUALISATION: WHOSE JOB IS IT ANYWAY?

**LOUISE MAYNARD-ATEM, CORDA**

This month I've decided to write about data visualisation, and once again the article is based on a recent discussion I had with colleagues.

We're all growing accustomed to seeing increasingly snazzy infographics in print, and interactive visualisations through various types of media; and the more data we produce (and in turn want to analyse), the greater the need to ensure the information is as clear and as easy to digest as possible.

My colleagues and I were discussing the need for data visualisation skills; should the capability be developed in-house or bought in externally? If anything, I think the demand for such skills is set to increase rather than decrease, and since moving out of government O.R. to work as a consultant at CORDA, I've certainly noticed the shift in emphasis towards thinking of the most effective ways to communicate with customers.

I could really not decide whether or not I think the capability should sit in-house or be bought in as and when; the best solution is probably a mixture of the two, but I wanted to use this article to explore data visualisation further and understand its impact on the O.R. community. Get in touch with me on the usual email address if you have any thoughts on this month's article or if there's anything else you'd like to bring to my attention ([lmaynardatem@live.co.uk](mailto:lmaynardatem@live.co.uk)), or tweet me @LMAtem.

## What is Data Visualisation? (And, equally importantly, what it is not!)

By visualising data, we are able to tell a story; the primary goal of data visualisation is to communicate information clearly and efficiently to users via the more appropriate statistical graphics, plots, information graphics, tables, and/or charts selected. Effective visualisation helps users in analysing data and evidence, thus helping users to make more informed decisions; it also makes complex data more accessible, understandable and usable.

In a business environment, the goals of visualisation can be broadly split into two categories: either explanatory, whereby the visuals are designed to lead the view along a defined path; or exploratory, whereby visuals can offer the viewer many dimensions of the data and invite them to ask questions along the way.

I'm often guilty of using the terms visualisation and infographic interchangeably however there is a distinct difference between the two: visualisations are created by a program that can be applied to many datasets (general), whereas infographics are hand-crafted for a particular dataset (specific).

There are about eight types of quantitative messages that users may attempt to understand or communicate from a set of data and the associated graphs used to help communicate the message:

- **Time-series:** e.g. line charts showing changes over time.
- **Ranking:** e.g. bar charts showing comparisons between categorical subdivisions.
- **Part-to-whole:** e.g. pie charts with categorical subdivisions measures as a ratio to the whole.
- **Deviation:** e.g. a bar chart showing comparisons of actuals vs. reference amounts.
- **Frequency distribution:** e.g. a histogram or boxplot showing key statistics about distributions.
- **Correlation:** e.g. a scatter plot showing a comparison between observations .
- **Nominal comparison:** e.g. comparing categorical sub-divisions in no particular order.
- **Geographic or geospatial:** e.g. a cartogram showing a comparison of variables across a map or layout.

**Examples – the good, the bad & the ugly**

In my opinion, a good example of data visualisation is something that is visually appealing, scalable, gives the user the right information and allows for rapid development and deployment. Handily enough, David McCandless (author of Information is Beautiful) has summarised his thoughts on this in a visualisation as shown in Figure 1. Data visualisation is both an art and a science, which is often why you will find the data that underpins a visualisation is collected and analysed by an analyst, but the visualisation itself can be designed and crafted by a graphic designer.



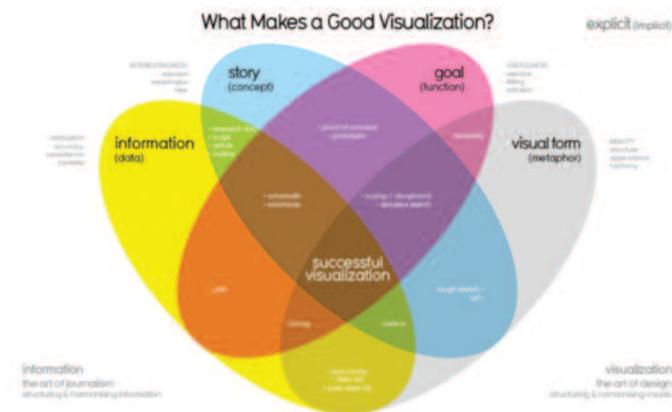
**Figure 2: Examples of good, bad and (in my opinion) ugly data visualisations (listed as such) – do you agree with my categorisation?**

**What does this mean for us?**

As O.R. practitioners, we visualise data on a daily basis, more often than not using excel, and whilst this might not be the best tool in the world, it is widely available, has ever improving functionality and is relatively easy to understand. Whilst I certainly don't think we all need to rush out and get graphic design qualifications, I do feel that it is our responsibility to develop a more in depth understanding of data visualisation and the tools that are available for us to produce clearer and more engaging results for our customers.

I'm currently experimenting with a few great packages;

- **FusionCharts** is a JavaScript charting library with over 90 different types of chart and 900 maps, it's really easy and intuitive to use with the only downside being the cost however you can download the unlimited trial version (which is what I'm using at the moment), to get a feel for it first.
- **Visual.ly** is a popular combined gallery and infographic generation tool; it goes slightly beyond pure data visualisation but can be used to create some really engaging standalone content.
- **Tableau** is a really popular tool for non-developers that supports a wide variety of charts, graphs, maps and other graphics. Again, there are both free and paid versions of this tool so you have the option of being able to try before you buy.



**Figure 1: What makes a good visualization? Taken from www.informationisbeautiful.net.**

A quick Google search will return lots of examples of data visualisation, some good, some bad and some, in my opinion, just plain ugly (as shown in Figure 2). Whilst it is important to understand what makes a good data visualisation, it can be equally informative to understand what makes a poor visualisation, in order to try and avoid falling into those traps when you're faced with the task yourself:

- Make sure you have considered the data you're dealing with when you are choosing to the most appropriate data visualisation; for example sometime percentage data have part to whole relationships and other times they represent overlapping sets, looking at the second image in Figure 2, the way the data is presented makes it look as though the figure in the picture is a 243% baby boomer.
- Don't try to overload the reader by cramming too much information onto one page; it's probably also best to avoid trying to create 3D representations when the data will be viewed in a 2D format (e.g. the third image in Figure 2) – these types of charts are usually difficult to read/understand and the presence of a third dimension does not add to your narrative.

## TAX RELIEF ON PROFESSIONAL SUBSCRIPTIONS

The OR Society is one of the HMRC approved professional bodies under Section 344 of the Income Tax (Earnings & Pensions) Act 2003 - and is published by them as 'List 3' - therefore, if you are a UK tax payer and pay your own membership fees, you may be entitled to claim tax back on your subscription fee.

### Who can claim?

If joining the OR Society is advantageous to you in carrying out your work or is relevant to your job, members employed in the UK may claim tax relief on their membership subscription fee.

### Who can't claim?

Non UK tax payers, or members whose subscription fee is paid by someone else (e.g. employer).

### How much can I claim?

Higher rate taxpayers can claim 40% of their membership fee, while lower rate taxpayers can claim 20% of their membership fee.

### How to claim?

You must claim using a Self Assessment tax return if you already fill one in.

If you don't already fill in a Self Assessment tax return fill in form P87 and send it to the address on the form.

The OR Society is listed as 'Operational Research Society' in List 3. In order to claim tax relief, you will need your invoice for your membership payment.

More details can be found on the HMRC website, [www.gov.uk/tax-relief-for-employees](http://www.gov.uk/tax-relief-for-employees)

<OR>

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**IMPORTANT:** Contributors please note. All contributions must be in four parts as follows (1) headline (approx 6 words); (2) mini-abstract (max 25 words); (3) main body of contribution (max 500 words); (4) keywords. At the editor's discretion, contributions exceeding 500 words will be shortened, serialised or published with the warning Long article. X words. Whenever possible contributions should be submitted electronically as Word files and emailed to [insideor@theorsociety.com](mailto:insideor@theorsociety.com). Illustrations should be attached as JPG, GIF, TIF or files of other common formats. Contributions submitted in hard copy must be posted to The OR Society at the address above, or sent to the Society's fax number, and be clearly marked Inside O.R. All contributions must bear the author's name and address (not necessarily for publication). All contributions accepted by the editor will be published in the print version subject to availability of space. The editor's decision on all contributions is final and no correspondence will be entered into.

## OR-30

Being the father of two chefs, a paper by Hodson, Muhlemann and Price, Bradford Management School about cooking was a natural choice. The problem is essentially one of scheduling but with a number of interesting constraints. The business is preparing, cooking and chilling meals to be subsequently reheated and served some 3-4 days later. Food which has been cooked has to be chilled within 30 min or it is discarded as unfit for human consumption.

Each item on the menu takes an unknown and fairly variable amount of time to prepare, a fixed time to cook (with a small variance) and a fixed time to chill (also with a small variance). Some of the items do not require cooking, others require two stages e.g. shepherds pie requires stewing and baking). Most of the equipment has to be cleaned after each batch although some can be used for several batches provided it is of the same item. The ovens are cleaned at the end of each day. Each chiller can only take one rack at a time and once started cannot be interrupted until that rack has been chilled to 3° C. Cooking times can vary from 0 to 120 min, chilling times up to 90 min.

The initial aim was to generate a daily schedule that would ensure 4500 meals were produced per day without the need to resort to overtime. The longer term aim was to do the same but with up to 7500 meals a day using the same staff and equipment.

It was decided to go for a 'feasible' rather than 'optimal' solution due to a lack of confidence. External consultants had suggested a bespoke program to model the whole system at a price of £30,000. This was rejected because: a) this would be more than it would cost to employ a full-time planner for two years; b) they would not know whether it was any good until after it had been completed; c) the program would be too big to run on a microcomputer so would have to be run on their remote mainframe and; d) the processing area would be very difficult to model as there was no data and it was very much dependent on the individuals employed in that area.

The completed program was able to produce daily schedules for 4500 meals in 2 min (and 4 min of printing). This takes the manager around 30 min normally. It was also able to produce schedules for up to 7500 meals in under 30 min which took the manager some two days to produce.

Hodson A., A.P. Muhlemann and D.H.R. Price , (1985), A Microcomputer based solution to a practical scheduling problem, *JORS* 36.10 pp 903-914 (Jors1985160a.pdf)

<OR>

## OR-20

### DEBATE

#### Surely DM wasn't fuzzy, was he?

My marketing Director once commented that 'any fool can take a decision when he has data'. He might have expressed it differently but he certainly had a point. After many years of working in management science, I have come to the conclusion that the 'numbers' we pump into the management process account for only a small part of the weighting that goes into managements' final decisions. What most managers take from our work is a better understanding of the operations to manage.

#### Scientific to a degree

One might view such decisions as forming a fuzzy set, namely the set of scientific decisions. Thus all management decisions are scientific to a degree, the extent of which can be assigned a membership value. I recall when my company decided to seek 'scientific' help in evaluating all of its professional staff. My post evaluation enquires revealed that the new data contributed less than a 20% weighting to the salary committee's decisions on salaries and promotions. In fuzzy terms the membership value for these scientific decisions could be taken as < 0.2.

#### Delivering fuel

When my O.R. team was investigating the composition of the truck fleet for delivering fuels to service stations it concluded that whenever possible the largest trucks should be used subject to local

physical restrictions. Certain sites with limited access determined the number of small trucks needed in the fleet. On further investigation we found that some of these restrictions were firmer than others. For example, on one site the removal of a small brick wall opened it up for the largest sized truck. Thus some restrictions were real; others were less so. The problem of providing reasonable restrictions becomes acute whenever mathematical programming models are being used. Although such analyses increase management's understanding of the problem, they can only partially affect their final decisions.

Can a management decision ever be 100% scientific? I recall on one occasion being asked to provide help in resolving a difference of opinion regarding the best way of controlling a new truck loading rack. Two quite distinct designs had been proposed. I first interviewed the groups that were championing each approach to make sure that they were in possession of the same data. Following this I modelled the loading rack operation using a queuing model. I then persuaded both groups to participate in a physical simulation to test each of their designs. During this work it became obvious to the groups which design would perform best under operational conditions and it was accepted unanimously. This is the closest I have ever got to a scientific decision.

By Ernest Field

<OR>



**HEAD OF CRM STRATEGY - MALTA**  
**To c€90,000 + Bonus + Benefits**

Our client is a leading on-line entertainment sector business, based in Malta, where employees enjoy an informal, multi-cultural environment, offering 20c+ sun for 300 days a year, with significantly low cost of living. A major re-structure and impressive growth performance are driving the creation of this new CRM role, responsible for the full roadmap related to the customer's lifecycle. With a demonstrable OR track record, you will also need proven experience of Direct Marketing, Customer Strategy, or a related data driven role. **Malta**

**EXECUTIVE PRINCIPAL-GOVERNMENT CLIENTS**  
**Package to £160,000/£170,000**

This prominent management consultancy, a class leader in digital consulting, is boosting its UK Government analytics capability through the creation of a new, senior level executive management role, representing an enviable career challenge for the right top calibre consulting professional. Previous experience, representing Government and related sectors, could include behavioural insights, operational efficiency, fraud analytics, data mining/modelling, forecasting or business intelligence; underpinned by sound business development capabilities, confidence and the ability to inspire. **Central London based**

**HOME BASED ANALYTICAL CONSULTANCY**  
**Guaranteed Fees**

Our client is an established boutique consultancy, offering particular expertise in data analysis, process mapping, forecasting, optimisation, simulation and related techniques, utilising tools such as Excel, VBA, Access, Tableau, Witness and Simul8. With a proven Associate/Contract hiring model representing a high calibre team of analytical professionals, significant growth in demand for their services is prompting the need for additional consultants offering 5+ years of demonstrable external or internal consulting success to date. **Flexible home location – M5/M6/M40/M1 Corridors ideal**

**DATA SCIENTIST**  
**To c£50,000 Package**

As part of building a world class analytics team, our client seeks a talented achiever able to combine impressive academic credentials (to MSc or PhD level), with proven data science experience and an aptitude for activities such as optimisation, forecasting, pricing analytics and revenue management. Specific experience of advanced statistical activities (Bayesian analysis), data visualisation (Tableau) and R, Python and SQL or similar tools, would be highly advantageous. Excellent social integration skills and genuine commercial acumen are essential. **Central London**

**OA/DECISION SUPPORT CONSULTANTS**  
**£Negotiable DOE**

We are currently looking to recruit high calibre Senior Operational Analysis & Decision Support Analysts and Consultants for a world class Electronics Engineering Company to join their expanding Operational Analysis/Decision Support capability which has been high-lighted as a primary growth area for the business. Opportunities are available to be based from their Hampshire offices (Close to **Southampton**) or to be home based and working on client sites in **London, Andover, Portsmouth, Cheltenham or Bristol**.

**'GREENFIELD' PRICING MANAGER**  
**To£60,000 DOE + Benefits**

Our client provides market intelligence, news and analysis, bespoke consulting and industry events to millions of customers worldwide through online platforms and subscription services. They are currently looking for recruit a high calibre Pricing Manager to develop a capability focussing on pricing strategy, pricing analysis and performance management ... this is a new role to the business and the opportunity to develop the capability, and in the longer term, a team are evident. **London EC1**

**SNR COMMERCIAL INSIGHT ANALYST**  
**To £48,000 + Bonus**

Exciting opportunity to join this fast paced and dynamic retail client's Business Strategy and Insight team. The successful candidate will be highly numerate and possess strong analytical skills proven by experience of analysing sales and marketing performance data and distilling key insights. You will be a confident, independent and logical thinker with an interest in commercial insight. Advanced Excel and PowerPoint skills required, and an appreciation of marketing mix modelling (econometrics) beneficial. **London N2**

**GLOBAL OCEAN FREIGHT ANALYST**  
**To £55,000 + Benefits**

Our client is a leading logistics services provider, delivering Air, Rail and Ocean Freight Supply Chain expertise, globally. A delivery focused consultancy role, this newly created position requires excellent modelling and analytical ability. Also well-developed technical skills to include Optimisation software knowledge and excellent client facing capability is essential. Previous Supply Chain industry experience is required and individuals with Freight knowledge would command premium attention. **Home & UK Wide Travel**

**DATA SCIENTIST**  
**To £48,000 + Benefits**

This role represents an excellent opportunity for a talented Data Scientist to be trained and work upon a brand new Asset Management system. The successful applicant will continue to develop their analytical and modelling expertise whilst also providing value-added insights, building relationships and interpreting business needs. Significant experience in using advanced analytics is required. Applicants should be technically strong (SPSS, SAS or R) with impressive interpersonal skills. **Midlands**

**INVENTORY FORECASTER**  
**To £23,000 + Benefits**

Exciting opportunity to join the dedicated OR team of a global Logistics market leading 4PL solutions organisation. The successful applicant can expect to be applying their quantitative analytical problem solving techniques to resolving Inventory Modelling, Planning and Forecasting issues. A numerate degree and a minimum of 6 months' Inventory/Stock experience is required, coupled with strong Excel skill and an understanding of the supply chain process. **Lancs**

With over 30 years of specialist market knowledge, Prospect is uniquely positioned at the forefront of Operational Research and related areas.

- Forecasting & Optimisation
- Business Modelling
- Process Re-engineering
- Financial Modelling
- Credit & Risk Management
- Change Management
- Simulation
- Customer Relationship Management
- Revenue/Yield Management
- Marketing Analysis

**STRATEGY ANALYST**  
**£30,000 to £40,000 Negotiable**

Responsible for revenue forecasting and analysis, business case development and the identification of new opportunities and strategies, you will need to use your analytical skills to understand the complexities of the business and your ability to communicate throughout the organisation to influence decisions and translate these into tangible actions. So, if you like numbers, can think outside the box and want to have a real influence in business decisions – please get in contact to find out more. **London Euston**

**LEAD ANALYST - PRICING**  
**£40,000-£45,000 + Benefits**

Our client is a leading UK Retail Brand and with a newly created Pricing team. Prospect is retained to identify an accomplished Lead Analyst to execute their Customer Price Perception strategy. Engaging with senior stakeholders, this individual would need to bring a high level of numeracy, influencing ability, data analysis and insight provision to the role. A strong academic grounding plus circa 3 years Analytical experience is required. **Herts**

For an informal discussion in total confidence on any of these positions or the market in general, please contact: Teresa Cheeseman, Kate Fuller or Mark Chapman. Alternatively visit our website to view our current vacancies.