

THE SCIENCE OF BETTER AT THE HEART OF ANALYTICS

INSIDE O.R.

SEPTEMBER 2015 NO 537



TRENDS IN TRANSPORTATION AND LOGISTICS

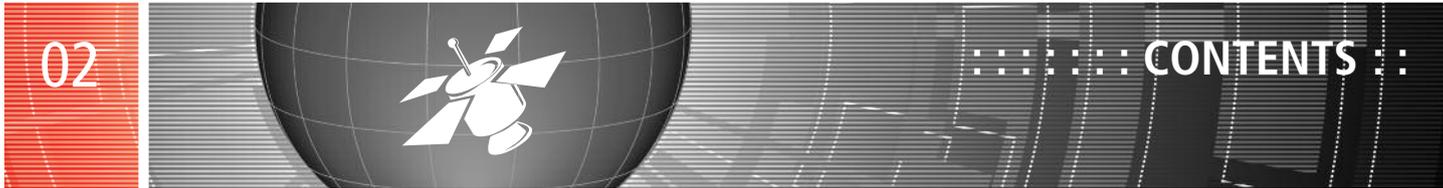
:: INSIDE THIS MONTH :: :: :: ::

FROM DATA TO DECISIONS - THE DIGITAL ELECTION
IF THE CAP FITS
EURO2015 BUSINESS ANALYTICS
TWO BIRDS, ONE STONE



THE OR SOCIETY

www.theorsociety.com



EDITORIAL

JOHN CROCKER

One of the more difficult decisions an editor has to make is how long to run articles from a given event. In July, EURO2015 was held in Glasgow (as regular readers will only be too aware). At that event there was hundreds of presentations with some sixteen plenary, keynote, tutorial sessions alone – more than enough potential material to keep this magazine in articles for several years. In September, we have the YOR Conference which, although much smaller, is also likely to provide a potential source of dozens of articles. This month, we have the last of the articles from the Analytics event and several more from EURO.

There is an interesting article from Louise in Y2OR. One of the papers she has used to illustrate her case is taken from the *BMJ* which looks at survival rates and whether one course of treatment is harmful. It is interesting because it is based on data from a very large number of cases (over 70,000) so could be considered as entering into the realms of 'big data' but more importantly, the data is not from a clinical trial and there is no follow-up on those involved other than the fact that they either survived for a year or they died at some known number of days after their treatment - what they did between is unknown.

One of the criteria put forward by Karl Popper with respect to science is that experiments should be repeatable. Keyes argued that this made economics into a pseudo-science. Checkland, at a conference in 1985, argued along similar lines about operational research (see OR -30) – this led, in the UK, at least, to the sub-branch of O.R. now known as 'Soft OR'. 'Hard OR' is still very much with us as you can see from Martin Savelsbergh's presentation at EURO2015, Michael Trick's presentation (also at EURO2015) and from the interesting report about the EURO Summer School written by Antonio Andrade.

Whether O.R. is soft or hard, is it here to stay? Both the RSS and ORS have been trying very hard to recruit people from the world of Analytics but, as yet, neither have been very successful. This has led to a joint meeting with the Royal Statistical Society has been scheduled for December to discuss what we (and other professional societies) can do to ensure our future. It is suggested that they may not be around in 35 years. President Elect Ruth Kaufman suggests the problem is far more imminent and serious in her leader, at least for our Society. No doubt this will be one of the many topics discussed at the next meeting of the General Council (in September).

Raphael Zollinger talks about Sayara Beg's initiative to create a new branch of the 'International Toastmasters' – the Toastmasters Data Science Speakers Club which meets fortnightly in London. It sounds like good fun as well as being career enhancing. If you are interested and have the opportunity to attend one, or more of these meetings they would be most happy to see you. This is a new area for O.R. as far as I am aware and might just be what it needs to help us survive.

Back in the early 1970s in the days of British Rail, Richard Eglese was just starting his long and illustrious career in O.R. In our [fairly] regular series which takes a look at what started some of us on this path, Richard tells how he 'fell' into O.R. so deeply that he never managed to get out!

If you have any snippets for our monthly News-in-Brief section or have any strong views on any aspects of O.R. or Analytics or even if you just want to see your name in print then please write to us.

<OR>

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New director for Alan Turing Institute

The Alan Turing Institute has marked its first month of operations with a dizzying list of announcements. It has a new director, a £10 million research funding grant from Lloyd's Register Foundation, a research partnership with GCHQ, a collaboration with Cray Inc. and funding from the EPSRC.



Professor Andrew Blake will join the Institute in October, as its first Director, potentially for five years. Andrew Blake is currently a Microsoft Distinguished Scientist and Laboratory Director of Microsoft Research UK. He is an Honorary Professor in Information Engineering at the University of Cambridge, and a leading researcher in computer vision.

More at: <http://bit.ly/1JcqC8l>

IS Tactics

Researchers in the US have used artificial intelligence to better understand the military strategy of Islamic State extremists. Analysis established a causal link between air strikes and roadside bomb attacks as well as a connection with the jihadists' use of military tactics.

Analysis of IS activity during the second half



of 2014 has indicated an increased use of vehicle-borne bombs is likely to occur before large infantry operations. Air strikes, however, tend to result in IS forces switching from large infantry-style operations to the use IEDs. (Or, at least, it did until they read this report!)

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

Your nuts m' lord

A study from researchers at the business schools of the University of Toronto, Duke University and the National University of Singapore confirms we are likely to be less inhibited when ordering online.



The study suggests that if you are ordering [a meal] face-to-face then you will exercise more constraint than if you sit in front of a computer screen to make your order. This suggests there may be a business case for interactive menus such that you order and pay online and the waiter or waitress simply brings what you have ordered to your table.

More at: <http://bit.ly/1O7b7Pj>

Mathematical Scarves

Fabienne Serriere has created a company called KnitYak which will produce merino scarves in black and white each knitted using a unique algorithm. She has raised the funds for an industrial knitting machine via a Kickstarter campaign.



Serriere said, 'I set out on a journey to find code that created images that look great 'pixelly' as a knit. Knitting is made up of tiny 'v's, not square pixels, so that also played into the choice of algorithms.'

Each scarf is shipped with the code used in its design, plus the generating key used to make the pattern.

More at: <http://kck.st/1eFXnPX>

Red or White?

UCL academic, Dr Tristan Fletcher, has applied complex AI techniques to the chaotic arena of fine wine pricing, comparing them with trading techniques used for more typical asset classes. His machine learning approach to predicting fine wine pricing has proved more accurate than other more traditional trading methods.



'I first started collecting wine data a few years ago,' says Fletcher, 'I used to work as an algorithmic trader at a hedge fund and I wasn't allowed to trade normal assets, and wanted to trade something that you could still buy and sell on exchanges, because that's what I knew about'.

More information on this can be found at: <http://bit.ly/1LeGF4Z>

Paper Clouds

According to a survey by document management solutions provider Margolis' data, approximately one fifth of businesses



are paperless, a further 30% think they might be by the end of the year but 6% said they had no intentions.

When asked how often they used the cloud, the majority of respondents (56% - all business owners), answered daily or more frequently. This clearly demonstrates the significant rise in cloud usage in recent years and a growing dependency on being 'connected' both at work and at home.

I know where you're going

A study published by Qlik, a company that specialises in 'visual analytics', states that while companies are realising the value of implementing advanced analytics, few feel they are where they need to be.



Qlik apparently is trying to change the way companies use supply chain analytics. They hope to do this by developing visual, multi sourced, predictive platforms which assist productivity and provide users with what they term, 'self-service data visualisation, reporting, dashboards, guided analytics, and embedded analytics'.

More at: <http://www.qlik.com/us/company>

IoT let's see

According to a new study published by Tata Consultancy Services (TCS), eight out of ten businesses that invest in the Internet of



Things (IoT) reported revenue growth in 2014.

On average revenues grew by 16% with 9% reporting growth of more than 30% as a consequence of their investment in the IoT with North America and Europe leading the way. It is predominantly being deployed to monitor progress through the supply chain (45%) and meeting customer needs through their use of mobile apps (47%).

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

Complaints breed complaints...

Three professors, Liye Ma (pictured), Baohong Sun and Sunder Kekre, have concluded that, '[Some] people complain on Twitter not just to vent their frustration; they do that also in the hope of getting the company's attention. Once they know the company is paying attention, they are more ready to complain the next time around.'



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

Hartley Rogers Jr. (06.07.1926 – 17.07.2015)

Hartley Rogers, Jr., professor emeritus of mathematics at MIT, is credited as one of the main developers of recursion theory, and of the usefulness and validity of informal methods in this area. His 1959 paper 'Computing Degrees of Unsolvability' obtained semantical completeness results for higher levels of arithmetical complexity. Rogers was a popular and respected teacher. In 1996, he initiated SPUR which teamed undergrads with tutors to work on a six-week project through the summer. In

2001, this was given the added impetus of the Hartley Rogers Jr Prize for the best team.



A full obituary can be found at: <http://bit.ly/1PgR2Gn>

More at <http://bit.ly/1WxBPX4>

Banish winter blues

ICORD 2015 is this year being held in Sri Lanka 3rd and 4th December. ICORDs (International Conference on O.R. for Development) are organised in a workshop format. It provides adequate time for presentation by the participants followed by discussions. Formal discussants/ reviewer (amongst the participants) are identified for each paper based on the theme of the paper and interest of the participants, in addition to open discussion.

For more: <http://ifors.org/icord2015/>

Three coins in a fountain

Come to Rome in February (25th and 26th) and enjoy an ICORES (International Conference on O.R. and Enterprise Systems) conference as well as having the chance to listen to a talk by Sue Merchant.

For more: www.ICORES.org

CJ SIG

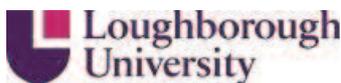
The next meeting of the Criminal Justice SIG will be held on the afternoon of 18th November in London. Subjects are likely to cover the work Flying Binary have been doing on 'Smart City' data platforms, drug abuse, rostering and 'wellbeing' measures.

For more: <http://bit.ly/1BSpKkK>

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**

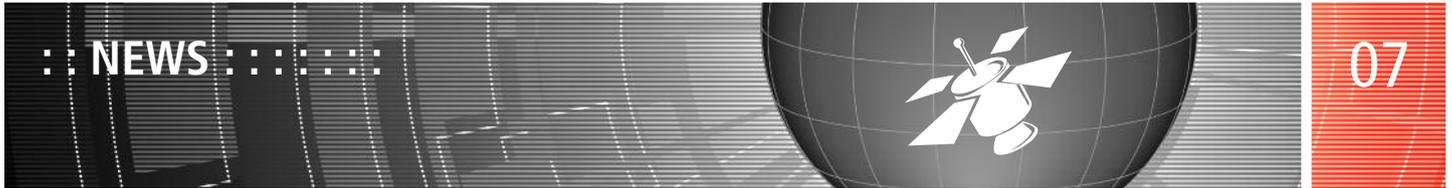
Reserve a stand for £330 +VAT



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

**Find out more online at
www.TheORSociety.com/CareersOpenDay**



YOUNG OR 19 – ATTEND THE ENERGY AND CLIMATE CHANGE STREAM



Given the global concern with high emissions, there is a drive amongst both governments and industries worldwide to find new means for improving energy efficiency, security and reducing our emissions. For many this has led to the increasing application of O.R. tools and techniques to inform and engage with the decisions that need to be made to support new innovations and improvements, and to effectively plan and optimise the infrastructure that supports the sector.

The Energy and Climate Change Stream will be jointly chaired by the Department of Energy & Climate Change and the National Nuclear Laboratory. It aims to recognise how O.R. is being applied in the Sector and is interested in what the crucial challenges are; what strategies, tools and techniques are being used to investigate them, and what the results of this work have been. There will be presenters and discussants from academia, the public and private sectors and collaborations between them.



Department
of Energy &
Climate Change



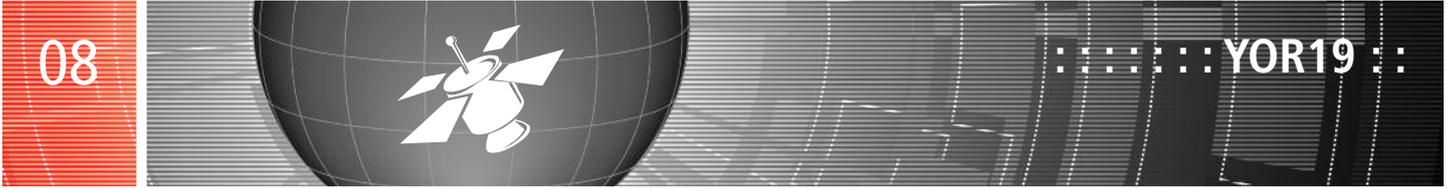
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<OR>

CONFERENCE NEWS

EVENT:	YoungOR 19	DATE:	22 – 24 September 2015	VENUE:	Conference Aston Marketing Suites, (CAMS), at Aston University
EVENT:	Blackett Lecture 2015	DATE:	26 November 2015	VENUE:	Grocers' Hall, London
EVENT:	8th Simulation Workshop SW16	DATE:	11-13 April 2016	VENUE:	Ettington Chase Hotel, Stratford



YOUNGOR19 SPONSORS AND EXHIBITORS

If you would like us to promote your company, then join our sponsors and exhibitors below. Raise your profile among the people who are the future of O.R. www.theorsociety.com/YOR19

22 - 24 September 2015 – Aston Business School, Birmingham



LLamasoft, Inc. provides software and expertise to help large organisations design and improve their supply chain network operations. LLamasoft Supply Chain Guru is the leading supply chain design and analysis application available in the market today. It enables companies to model, optimise and simulate their supply chain operations, leading to major improvements in cost, service, sustainability and risk mitigation.

LLamasoft is dedicated to advancing technology focused on the continuous improvement of enterprise supply chains. Our customers include many of the world's largest organisations across a wide range of industries.



Dstl is a trading fund of the Ministry of Defence (MOD), delivering trusted and often confidential advice and solutions on defence-related science and technology that impact on the security of the UK. Details of Dstl's current graduate vacancies can be found on our website at www.dstl.gov.uk/careers



Prospect Recruitment is a niche consultancy specialising in the quantitative analytical arena, with our roots in the Operational Research/ Business Modelling field going back over 35 years. The combination of this market focus and our consultants' extensive knowledge of this specialist arena, has successfully underpinned our recruitment activities, which span the full range of private sector industry and commerce.

Ranging from O.R. applications such as linear programming, optimisation, simulation and yield management; through financial modelling, forecasting and system dynamics; to customer insight, marketing, risk and pricing analytics; and statistical analysis and related decision support, we are able to offer immense depth of market knowledge and insight.



Palgrave Macmillan is a global academic and business publisher, serving learning and scholarship in the academic and professional worlds. Palgrave Macmillan is proud to be the publisher of the OR Society journals and also publishes a leading portfolio of books and journals in OR/MS.

At YoungOR 19, come to the Palgrave table and pick up a sample copy of our journals.

YoungOR19

22-24 September 2015



Join us at our YOR19 Conference!

There is still time to book for three days of exciting opportunities for those in O.R. for ten years or less.

Learn with us, enjoy some great networking, listen to our highly knowledgeable plenary speakers, take part in our workshops, get careers advice from our panel of experts and much more.

BOOK NOW at www.theorsociety.com/yor19

Interactive Workshops

Sign up for Analytics, Consultancy, O.R.in Schools, Travel, Simulation Modelling and more!

Plenary Talks

Come and listen to
Alex Phillips – 'Fan engagement in Sport',
Stewart Robinson – 'OR in the Age of Big Data' and
Graham Rand – 'Widening O.R's customer base: from Bawdsey Manor to Pro Bono'

Careers Panel

On Thursday afternoon our careers panel are representatives from a variety of industries and they will be willing to answer any careers questions you may have, so put your thinking cap on now!

www.theorsociety.com/YOR19



WHO DO I THINK I AM?

RUTH KAUFMAN PRESIDENT ELECT.



‘As OR Society President Elect, I am interested in the implications for the Society. We know that we want to attract not just those with a strong O.R. professional identity, but everyone working in and around O.R.’

Who do you think you are? That’s what Frances O’Brien asked at her EURO2015 workshop exploring professional identity. When you talk to other people about what you do, she said, how do you describe your role? Do you see yourself as a professional with a strong sense of professional identity? And – she did not ask, but may well have done – does it matter?

These questions made me think. I have been an analyst in four substantial O.R. groups, with lengthy spells in pricing, management, strategy and change alongside. I have developed a range of professional identities, including ‘rusty maths graduate’; ‘jack-of-all-trades analyst’; ‘leader and change agent’. Yet it was not until near the end of my career, after several years heading up a flourishing O.R. group, that I gave myself permission to include Operational Researcher as part of my professional identity.

Some of you reading this are no doubt confident in your O.R. identity. But casual conversations, straw polls, and talks at Young O.R. and Government O.R. conferences show that I am not unusual. A great many people who are studying or working in our profession, successfully making a difference to the world, are quick to assert ‘I’m not a *real* O.R. person’ or ‘What I’m doing isn’t *really* O.R.’.

Does this matter?

Well, on the one hand, yes. Being part of a professional community gives you access to appropriate benchmarking and development, which distinguish your role, improve your practice and outcomes, and support your career.

It also benefits the community if people identify with it. Indeed, elsewhere in this issue Tony Bendell argues that the trend for data and analytics professionals *not* to identify as either statisticians or O.R. analysts could lead to the death of both professions by 2050.

On the other hand, perhaps it doesn’t really matter what you call yourself. Your sense of professional identity is a very personal thing, driven by your experiences and circumstances (if you want to know more, Frances will shortly be up-loading her slides onto the OR Society document repository, alongside the other EURO2015 material). O.R.’s multi-disciplinary outlook should be broad enough to accommodate all sorts of identities.

What does matter, I think, is that people working in or around O.R.

– i.e. engaged in improving organisations’ or activities’ outcomes using whatever scientific/ mathematical methods are appropriate – recognise that they share enough characteristics with the O.R. community to make it worth getting involved with. These characteristics may be ‘knowledge of optimising techniques’, and ‘ability to do really difficult sums’, but they may also include being versatile enough to get to grips with any problem; knowledgeable enough to identify approaches that will work in the specific situation, as simple or complex as necessary; visionary enough to want to use rational analysis to make the world a better place.

As OR Society President Elect, I am interested in the implications for the Society. We know that we want to attract not just those with a strong O.R. professional identity, but everyone working in and around O.R.

We already do a lot. Regional and Special Interest Groups, publications, online resources, conferences, ‘Making an Impact’ practitioner events, Pro Bono O.R. and O.R. in schools, training programme, the Analytics Network are among the routes we are using to make O.R. visible and relevant to a wider variety of people. And the thriving participation in these activities, the huge numbers attending EURO2015, the sparkle in the eye of people coming across O.R. for the first time, suggest that the glass of ‘the future of O.R.’ is at least as full as it is empty.

Nonetheless there are even more people whose ‘shared characteristics’ mean that it would be great for them, and for the OR Society, if they got involved. This includes people within the O.R. world, people working in overlapping or neighbouring professions including data and analytics, or in application areas such as local authorities where O.R. is currently barely visible. There are fantastic opportunities for us, if we can grab their attention, help them recognise the relevance of the O.R. community, and encourage them to get involved.

The joint OR/RSS event flagged up in Tony Bendell’s article will explore how we do this for Data Science and analytics professionals. Are there other areas that we should also be looking at?

This is where you, the reader, and your own professional identity, come into the picture. I have already confessed that it took me many years before I decided that I Am An Operational Researcher. With all the zeal of a convert, I encourage any other doubters to believe that you too have, at the very least, a bit of Operational Researcher in you. And if *your* O.R. professional identity is just one of several, you may hold the key to helping us get in touch with other people in other groups. If so, do, please, get in touch, and perhaps together we can open up the O.R. identity a little further.

<OR>

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?

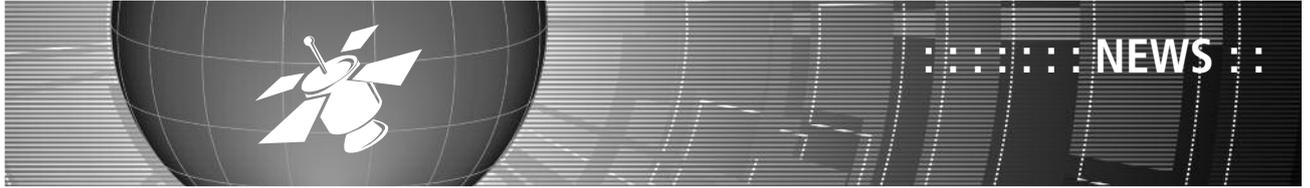
You must claim using a Self Assessment tax return if you already fill one in.

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

<OR>



ELSIE CROPPER SHIELD FOR BEST PAPER AT YOUNGOR 19 CONFERENCE, 22 – 24 SEPTEMBER, 2015



J.C. RANYARD

The Elsie Cropper Shield was instituted in memory of Elsie May Cropper, a senior member of the Operational Research Executive of British Coal, who died in service in 1989 at the age of 44. Elsie had always been a strong supporter of young and trainee O.R. staff and was always supportive in their further development.

All presenters at YoungOR 19 are eligible, except for Plenary Speakers, those giving tutorials or workshops and those who would not normally be eligible to attend the YoungOR conference.

All YoungOR 19 delegates are invited to rate the presentations that they attend, using a pro forma which is available at each session. The session chair will collect the voting papers at the end of each session and pass them on to the committee. The Organising Chair will appoint two judges, one of whom will be a member of the organising committee. The judges will scrutinise the voting papers and decide on the winner.

The following criteria will be used as guidelines:

1. Impact of the work – both quantitative and qualitative. For example, does the work have current/potential demonstrable

- benefits; has it resulted in a better understanding of the problem area or improved management practices?
2. Technical Content – for example, appropriate choice of techniques/methodologies.
3. Quality of presentation – for example, logical structure, clear slides etc.

The winner will have his or her name inscribed on the Elsie Cropper Shield and will be invited to attend the Blackett Lecture on 26 November 2015 at which the shield will be formally presented. The winner will also receive a commemorative plaque. The winner of the Shield will be announced on the last day of the conference after all eligible talks have been presented.

<OR>

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
Speaker: See below

Our next meeting will be held in London on November 18th from 1.30pm - 4.30pm. 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.

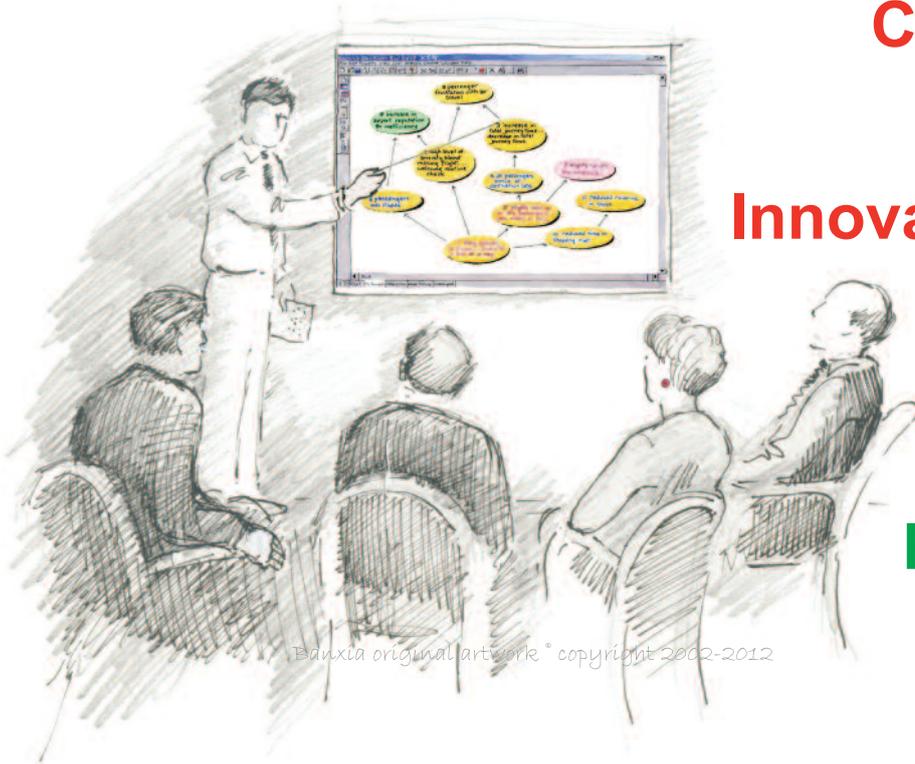
We look forward to seeing you there!

<OR>

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Innovative individual?

Problem solver?



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- ❑ **Connect™** - allows a group of people in the same location to collaborate in the entry of ideas around a topic, and then to organise them by preferencing, rating or otherwise evaluating them. Designed to support Visual Strategy Making alongside our Decision Explorer software, it is free to try it out, and supports up to 32 participants using tablets or laptops with any modern browser. Decision Explorer Connect starts at £99 + VAT for 8 participants.
- ❑ **Decision Explorer®** - an ideas mapping tool used to organise and structure an individual's or a group's ideas about a problem or issue. This is a piece of software with many uses, in areas such as strategic management, risk assessment, project planning/ definition and general problem structuring. Single user licenses start from £99 + VAT.

“Decision Explorer® has proven to be a powerful facilitative tool. Used ‘live’ in workshops it provides a very efficient and productive means of keeping participants focussed and communicating. As a means of joint decision making, I have not found better.” Kenny Forsyth, Consultant

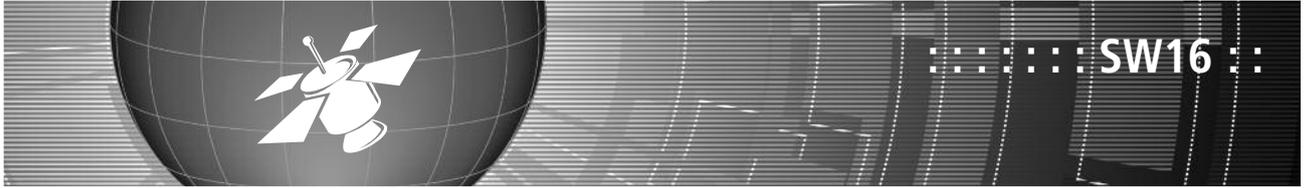
- ❑ **Frontier Analyst® Professional** - a performance measurement tool, using Data Envelopment Analysis (DEA), to give a relative assessment of the performance of a group of business units. Used in organisations that have a network of branches/ depots or in situations where a group of similar “units” can be identified (for example, hospital wards, banks, shops, teams within a company and so on). Single user (75-unit analysis capability) licenses start from £195 + VAT.

Contact us for details of any of these products.

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5 REASONS WHY YOU SHOULD ATTEND SW16

THOMAS MONKS AND CHRISTINE CURRIE

This coming 11-13 April 2016 sees the welcome return of the OR Society's biennial simulation workshop (SW16). The conference always boasts an excellent mix of delegates from the fields of simulation practice and research. The conference covers application and theoretical developments across all simulation methods, for example agent based simulation, system dynamics, discrete-event simulation and monte-carlo simulation. We have updated and refreshed the conference this year keeping the best of the original format and adding some exciting new elements.



Reason 1: A brand new location

This year we have given the conference a fresh new feel and switched locations to the luxurious Ettington Chase Hotel, Stratford-upon-Avon (www.ettingtonchasehotel.co.uk). This central location has good local transport links including from Birmingham International Airport.



Reason 2: An extra half day of simulation tutorials at no extra cost

Over the years we have received a lot of feedback from delegates asking for more technical talks about simulation methodology. The committee has been listening! We are pleased to announce that this year the conference will feature an extra half day dedicated to tutorial sessions for beginners and experienced simulation modellers alike. We are even doing this at no extra cost to delegates!

Confirmed tutorial speakers are:

- Prof. Stewart Robinson, President of the OR Society
- Prof. Russell Cheng, University of Southampton
- Dr Simon Taylor, Brunel University
- David Buxton, dse Consulting

Reason 3: Learn from and meet the top names in simulation



Sally Brailsford

The simulation workshop has a proud track record of attracting the top names in computer simulation as keynote speakers.

We hope to have two keynote talks this year from Professor **Sally Brailsford** and another speaker who has yet to be confirmed. Updates will be made to the conference website.

Previous keynotes have included Prof. Barry Nelson, Prof. Shane Henderson, Prof Charles Macal and Prof. Paul Fishwick.

SW16 not only provides a platform for learning from these top names, but also the opportunity to meet them and get feedback on your work, either during the formal conference sessions, at the three-course conference dinner or the coffee breaks between sessions.

Reason 4: High quality talks – guaranteed

The conference typically features 30 high quality practitioner and researcher papers detailing applied case studies and theoretical developments in the field of computer simulation. We ask delegates to submit a three-to-ten page paper that is published in our proceedings. Not only does this mean you get to take away 30 high quality papers in the proceedings, but it guarantees high quality talks!

Reason 5: Practitioner and researcher poster competition

If you don't feel your work warrants a full oral presentation then the practitioner and researcher poster option is for you!

Poster delegates produce an A0 or A1 poster showcasing their applied or theoretical simulation work and are asked to give a two-minute 'elevator pitch' presentation to argue why their poster deserves the title of SW16's best poster. We emphasise this competition is open to all SW16 delegates!

So why wait?



Learning and Development Programme

OR Society Approved Training Courses

O.R. AND SUPPLY CHAIN MANAGEMENT PROJECTUSING

9-10 September, Birmingham
£1,450 + VAT for OR Society members
Hands on course

Course provider: Nicholas Cron, Sigma Delta

NEW FOR 2015

You'll learn what is meant by Supply Chain Management and its importance in a business setting. You will also learn how O.R. techniques and models have a vital role in improving efficiency and effectiveness in the Supply Chain.

You will acquire practical skills and tools which will improve your performance as a manager: O.R. techniques often covered theoretically will be summarised and applied in relevant applied settings; Case studies, hands-on experience and discussions will be facilitated by experienced tutors and networking will be actively encouraged.

You will learn what is meant by Supply Chain Management and the importance of negotiation in good management; Supply Chain strategies, planning and control, performance and metrics; Supply Chain inventory management, forecasting and logistics management; O.R. and Procurement; Risk management within the Supply Chain

PROCESS OPTIMISATION AND ANTI-FRAGILITY – FRIENDS OR ENEMIES

17 September, Birmingham
£380 + VAT for OR Society members

Course provider: Prof Tony Bendall

The course will provide an examination of the need to improve on current optimisation practices and offer consideration of system and organisational fragility as well as process efficiency. You'll learn about the Anti-Fragility concept developed by Nassim Taleb and the common shortfalls in current O.R. optimisation approaches. Familiarise yourself with current research thinking and discover:

How fragility, robustness and anti-fragility is built in to organisational structures and systems; How to explore shortfalls and risk in current modelling approaches; How to take stock of fragility in relation to your own organisation and systems and construct an action plan to develop anti-fragility within them

INTRODUCTION TO O.R. II

21-25 September, Birmingham
£2,875 + VAT for OR Society members
Hands on course

Course provider: Frances O'Brien

Understand the role of Operational Research in management; understand the requirements for successful Operational Research interventions; have knowledge of a range of Operational Research techniques; be able to identify the suitability of a technique for a problem situation; be able to apply those techniques.

- Problem Structuring Methods
- System Dynamics
- Statistical Methods in O.R.: multivariate models
- Data Envelopment Analysis
- O.R. in Strategy

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

COMING LATER IN THE YEAR:

PRACTICAL PROCESS IMPROVEMENT USING LEAN AND 6-SIGMA 27 October

MANAGING SUCCESSFUL ANALYTICAL PROJECTS 28-29 October

AGENT-BASED MODELLING: WHAT, WHEN AND WHERE 3-4 November

**For details of all courses and to book online,
visit www.theorsociety.com
or call Jennie Phelps on 0121 234 7818**

Exactly how many chips is that?

Data is officially big. No, I mean really, really big.

With apologies to Douglas Adams, it's easy to dismiss the hype around the big-ness of data - and for the most part we should do just that. But

there is a deeper aspect to big. One billion minutes is almost two millennia ago - the year 112 - yet we would all laugh if someone offered us a new computer with a 1Gb hard disk! The truth is that once outside "human-scale" we really are hard pressed to digest large quantities properly.

With this in mind, we are offering three one-day courses in the OR Society's training programme for 2015 - The Science of Data Visualisation, From Big Data to Open Data and Actionable Intelligence. These three courses cover a broad sweep of skills from the specifics of creating visualisations, through methods of presenting and influencing, to the tools you can use to tame big and open data.



Oct

20

The Science of Data Visualisation

As the artist Ursus Wehrli shows in the humorous image above, if we can only apply order to our surroundings, we can gain insight. We must also be able to communicate that insight clearly - just as he does - and use that to drive effective action.

Oct

21

Actionable Intelligence

What would your working day look like if you always had the right answer, knew what action to take, and could persuade everyone else to commit to that path? Now imagine extending that to your whole team, department

Oct

22

From Big Data to Open Data

or organisation. We have examples where these skills have grown from a team of 10 to over 600 in two years. Why not you too?

The good news is that you can start exactly where you are, with the tools and data you have right now. All of the courses provide practical techniques that you can use right away, and we recommend leveraging your organisation's current assets - so you're not walking back in with a big purchase order request either.

Check out the Training Programme page today and claim your space!

<http://www.theorsociety.com/Pages/Training/TrainingCourses.aspx>



IF THE CAP FITS

MICHAEL MORTENSON

Experiences of taking INFORMS' Certified Analytics Professional exam



CERTIFIED ANALYTICS PROFESSIONAL

The OR Society has a long standing interest in analytics and in helping its members engage with the field. As part of this they have been investigating the possibility of providing INFORMS' Certified Analytics Professional award to Society members and the wider UK community. It was decided that it would be useful to have someone with first-hand experience of the exam ... i.e. a guinea pig. This was where I came in.

Having agreed to take the exam I did the usual thing that any conscientious student does: next to nothing for ages and then panicked at the last minute. In many ways the panic was unnecessary; this is not a 'book-smarts' exam but one where prior experience is really the only way to pass. You do need to have significant knowledge of the concepts and methods of analytics, but I would say its one-part theory to four-parts practice. Many questions specifically focus on practice-based challenges (stakeholder meetings, problem definition, lack of data, and so on) and even where the more technical questions arise, predominantly it is on the basis of selecting the right method to fit the problem, or identifying the steps to take when model performance dips. In short, and to INFORMS' credit, this is not an exam that can be bluffed, you have to walk the walk as well as talk the talk.

It is, however, an exam I would recommend, both to analytics/O.R. professionals seeking to 'prove' their practical expertise, and to employers looking for recruits who can genuinely hit the ground running. For the benefit of anyone considering the exam I will give you my perspective on assessing your readiness and how to best prepare.

For *recent graduates* my honest recommendation would be taking the exam after working on some real-life projects. However, you may be able to lean on a mentor or more experienced colleague. The handbook gives a reasonably thorough definition of the analytics project lifecycle so will give a good idea of the topics to cover.

Specialist consultants will likely have the necessary depth to cover many of the questions. However, the bigger issue is breadth. There are many debates about what 'analytics' actually is, and definitions range from 'another name for O.R.' to 'a branch of computer science'. This certificate is definitely more at the O.R. end of the spectrum (no bad thing to my mind), and for specialists with a predominantly IT-type background there will be the need to familiarise yourself with the O.R. cannon to a fairly extensive level. However, for those from an O.R. background, this alone is unlikely to be enough. You will need a reasonable knowledge of a range of topics including data warehouses, project management and machine learning.

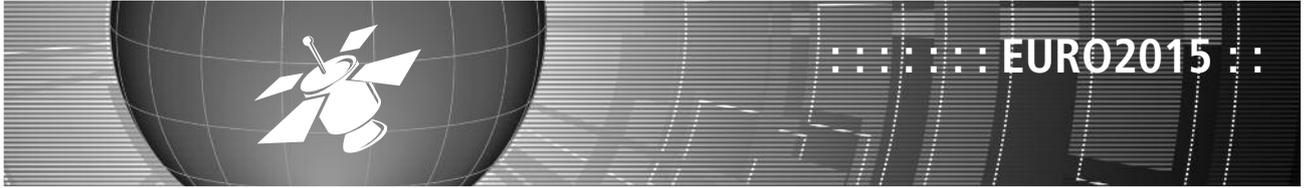
Ultimately I think the exam is best suited to analytics professionals working in larger companies, or those working on 'full-stack'-type projects. Whatever view you have on what analytics is, it is a wide-ranging field and the exam reflects this. For this group, working through the handbook and taking a refresher on anything that looks less familiar is likely to be enough.

Overall, I found the experience nerve wracking (my first exam in over 15 years) but rewarding, suitably challenging and definitely a source of personal achievement. As to whether it makes a massive difference to my career, well I've only had the award for one week so watch this space!

(According to the website (<https://www.certifiedanalytics.org/faq.php>) the pass rate is around 70% so now would seem a good time to enter. Ed)

<OR>

**JOIN OUR
ANALYTICS NETWORK**
Visit: www.analytics-network.com



EURO SUMMER INSTITUTE ON ONLINE OPTIMIZATION

ANTONIO ANDRADE

The beautiful city of Szeged, in Hungary, hosted the last edition of the Summer Institute of the Association of European Operational Research Societies (EURO) on Online Optimization. More than a learning experience, it was an excellent opportunity to network and meet researchers in this topic.



Csanád Imreh, the main organizer of the Summer Institute started with a tutorial on online algorithms, discussing the c -competitive ratio as a way to compare the performance of online algorithms with the offline optimal solutions. He introduced some initial problems (e.g. 'the cow problem', the 'ski rental problem') as motivating examples to perform competitive analysis of online algorithms.

Sandor Fekete explored online navigation and searching with autonomous robots in simple polygons, introducing the 'watchman problem'. He then discussed multi-robots situations and 'rendezvous' search problems, robot swarms with online triangulation of unknown environments, robot swarms for site patrolling, and an extension to control massive particle swarms with very small robots for medical purposes.

Joan Boyar explored a theoretical framework where we let the online algorithm receive some sort of advice from 'an oracle', for instance on future inputs. She then continued discussing the binary separation problem and introduced an advice complexity class of problems. Finally, she discussed different measures than the competitive ratio to compare different algorithms like the relative worst order ratio.

Jiri Sgall discussed randomized algorithms and showed some examples in scheduling problems, where randomness tends to help to reduce the competitive ratio. He also provided some results for lower bounds of the competitive ratio for the makespan scheduling problem.

Gerhard Woegingir started with a load balancing puzzle with 'Cinderella' and 'Stepmother'. 'Cinderella' tries to minimize the maximum volume of water in a bucket; 'Stepmother' tries to overflow any bucket. This problem motivated a discussion on pursuit-evasion games and interesting results using harmonic numbers for the continuous-bucket game.

Gabor Galambos provided a historical overview on the evolution of different lower bounds for the competitive ratio for the online bin

packing problem. Some very interesting ideas on how to generalize packing patterns were also discussed.

Jakob Krarup, the most senior speaker, provided one of the most inspiring talks I have heard for a long time. He talked about the origins of O.R. and its institutions. As a former president of EURO during the fall of the Berlin Wall, he provided some interesting background on the history of the association and the importance of international cooperation in Science as a promoter of Peace and sustainable development. In strange times where other walls are currently being erected in Europe, a historic and optimistic view reminded us that a brighter future is always possible!

Leah Epstein filled all the boards available in her discussion of online bin-packing problems with rejection, in particular the bin packing problem with rejection which can incur in a rejection cost.

Piotr Krysta started by introducing the idea of 'truthful mechanisms' that would incentivize agents to reveal their private information under a general framework to optimize social welfare. He introduced the multi-unit combinatorial auction problem that is used for instance in Telecommunications in Government Spectrum Auctions or Government procurement.



Finally, Csanád Imreh talked on online clustering in time-based clustering, also used in facility location problems and clustering models.

Student presentations included scheduling; fleet management; dispatching in emergency medical

services in transportation/logistics systems; discrete event simulation and; applications in graph theory and computer science. I presented some work on the application of some of these ideas in the braking systems of trains, an on-going project for the Strategic Partnership between University of Huddersfield and Rail Safety and Standards Board. I am still not sure on whether or not online optimization and competitive analysis is the right framework (Is Nature a nasty adversary in Safety Systems?), nevertheless, I feel certainly enlightened by the opportunity to participate in such an interesting event and learn from such a diverse group of people. I take this opportunity to acknowledge the generous financial support of the EURO and the OR Society.

EURO2015 BUSINESS ANALYTICS

NIGEL CUMMINGS

Michael Trick, Senior Associate Dean, Faculty and Research and Professor of Operational Research at Carnegie Mellon's Tepper School of Business gave a keynote address on business analytics and in particular combining predictive and prescriptive analytics to have 'broad impact'.



Recent advances in algorithms used in O.R., plus advances in computing and data capture have created an environment where the field of O.R. could exert tremendous influence. By combining predictive analytics, such as data mining and statistical approaches with prescriptive analytics such as optimisation methods, O.R. can create systems that would span multiple functions within organisations.

The first example he proffered concerned work done by Frederick Wallace 'Fred' Smith, the founder, chairman, president, and CEO of FedEx. His company, originally known as Federal Express, was the first overnight express delivery company in the world. Fred Smith was not an O.R. man, but he had a eureka moment, at the right time in history.

Fred Smith realised that as society became increasingly automated, there would be a need for a completely different logistics system – one which would deliver goods rapidly from city to city. The transport infrastructure prior to FedEx relied heavily on passenger airlines to move freight from location to location – this was inefficient as not all locations could be reached easily or at low cost.

Freight was being 'force-fitted' into a transportation system that was not designed for it. Smith originally envisaged a network of 11 cities where freight clearing houses could be located and then served by local transport and delivery networks. He created a 'hub and spoke' system of operation to make his company work. Initial trials were promising but 11 'hubs' were not enough. The reality was the FedEx system had to incorporate 23 cities as hubs/depots, and all of these with almost no overlap to run efficiently.

Operating from such a network reduced costs, optimised the distances travelled between warehouses to delivery points, accelerated delivery speed of goods and increased profits. The FedEx network grew at the same time as the company used predictive analytics to foresee areas of demand and prescriptive analytics to analyse data and transform it into recommended actions almost instantaneously.

Another example concerned the transformation of the United States postal service network (USPS) which is an extremely large and complex organisation providing many challenges in logistics. Professor Trick worked extensively on the Highway Corridor Analytic Program (HCAP) which had been developed to assist in the transportation planning processes for USPS.

The model involved, had to optimise existing transportation and identify opportunities where transportation costs and journey times could be reduced. The model also had to use existing data sources for near-term identification of savings opportunities. Utilising advanced analytics processes gave USPS the ability to improve services, reduce costs and gain considerable efficiencies.

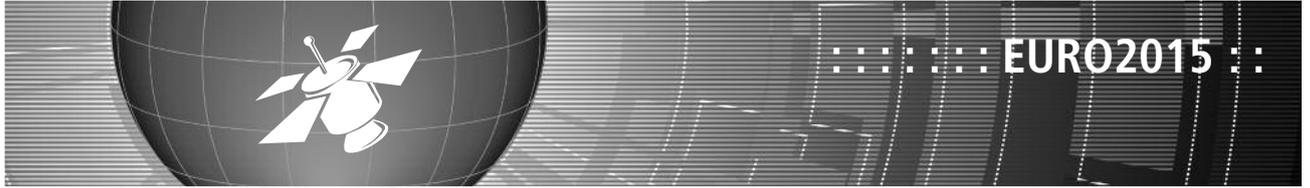
There were winners and losers in the world of analytics, an example of this concerned Yahoo and Google. Both started as hierarchical organisation systems which could be applied to provide search capabilities for use in web browsers, but Google grew to prominence, it remained competitive with Yahoo by continually innovating and developing its search engine. Provision of Google's automated identification of the best page for 'any search', and the implementation of its page ranking system pushed the company ever forward.

Google started selling advertisements associated with the help of keywords too. The ads were text-based to maintain the simplistic design of the page and to maximise page loading speed, and yet behind them was a great deal of analytics. At Google, 'keywords' were sold based on a combination of price bid and click throughs. Google also recognised at an early stage in the company's development that the real key to business success as search engine provider, was to recognise a network of links as data.

Yahoo conversely had a more diverse portfolio of services to offer, it wasn't just a search engine, the company had other services besides the original search engine and Email; Yahoo News, Yahoo Mobile, Yahoo Messenger; Yahoo Music, Yahoo Finance etc. It also provides next generation internet movement WEB 2.0 in the form of RSS feed, and offers social networking services and user-generated content in products such as My Web, Yahoo! Personals, Yahoo! 360°, and Flickr.

Both companies had been successful in their own right, one more for search capabilities and one for a more diverse product array. Both companies had one thing in common though, they used advanced analytics processes to optimise their operation and increase growth and profitability.

Regarding analytics in general, Michael Trick said, 'Measures of robustness are badly needed'.



EURO 2015, O.R. IN PRACTICE – THE 27TH EUROPEAN CONFERENCE ON OPERATIONAL RESEARCH

IAN M MITCHELL, FORS

OR Society representative to the Association of European Operational Research Societies (the original EURO).



Banners in George Square

A banner at the airport and more in George Square welcomed participants to EURO 2015. EURO Conferences often draw 2,000 participants, and require three years of preparation by an Organising Committee and a Programme Committee. Valerie Belton and Tim Bedford chaired the Organising committee, with the University of Strathclyde hosting EURO2015.



EURO Council - the annual gathering

Before the Conference opened I attended the annual EURO Council meeting. This is the only time that the members meet in person. The Council decided to admit OR societies of Norway and Tunisia to EURO, selected Valencia as the site for the 2018 EURO Conference and unanimously elected OR Society Past President Richard Eglese as its next President Elect.

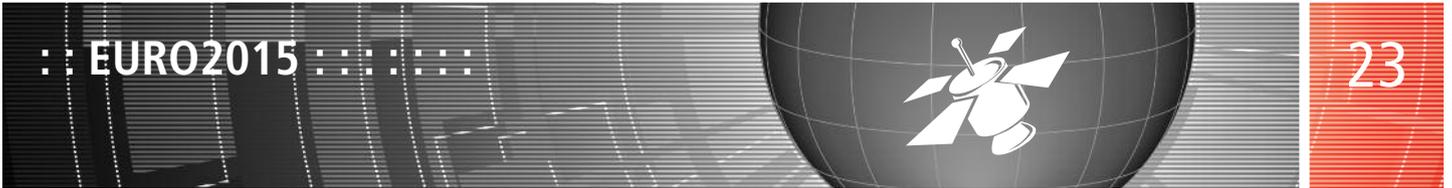


Vice President 1 Sally Brailsford at Lectern

EURO Vice President 3 Silvano Martello, Past President Gerhard Wascher, President Elena Fernandez with Treasurer Marino Widmer.



2,300 abstracts received crossed the threshold of 2000 for the wearing of a kilt by David Pisinger, the Chair of the Programme Committee at the Opening Ceremony.



Val Belton and Piper

A Piper led the way to the City Chambers for a welcome reception. Kilts, bagpipes, dancing and Irn Bru at lunch left no doubt which country we were in.



Tim Bedford chairs physical and virtual questions for Sir Alan Wilson's plenary

Keynotes and streams filled Monday to Wednesday. EURO2015 had a very broad scope. Themes included the big questions such as cities. Twitter @EuroConf2015 grew in use to inform, comment and co-ordinate journeys through the conference.

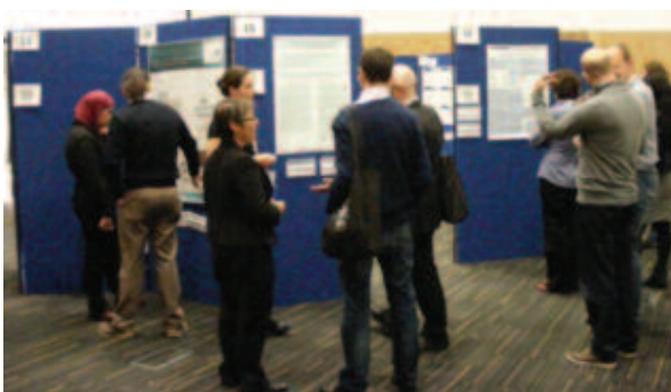


Speed Networking Ramune Sabaniene and bell



Applause for the Helpers

The closing ceremony thanked all who made the conference so successful before Awards and farewells. In 2016 the EURO conference will be in Poznan, Poland, and in 2017 the IFORS Conference in Quebec.



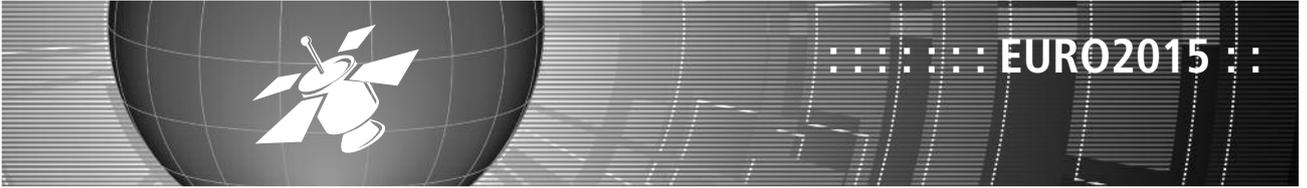
Academic Practitioner Bazaar

EURO2015 had a strong practitioner presence, introducing OR Society Conference Making An Impact favourites to EURO: speed networking, academic-practitioner sessions, workshops and mentoring.



Dancing resumed until late in the Barony.

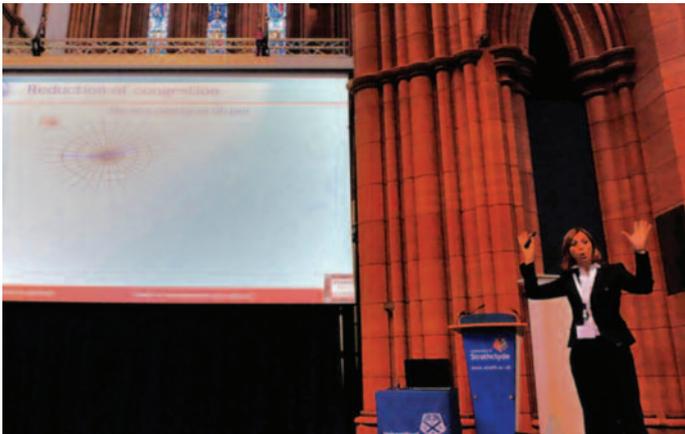
Auld Lang Syne and a final turn by the Organising and Programme Committee chairs marked the conclusion of a wonderful conference.



TRENDS IN TRANSPORTATION AND LOGISTICS

NIGEL CUMMINGS

One of the plenary sessions at EURO2015 was given by M. Grazia Speranza, Professor in Operations Research, University of Brescia. Her presentation provided us with an enthralling journey through transport and logistics history.



As far back as 2700 B.C. early humans had developed and used material handling technology, they had found ways to transport goods and people along routes from point of origin to point of delivery. Innovation and development of transport was slow in those early days, it was not until around 300 B.C. that the ancient Greeks revolutionised transport with their development of durable rowing vessels capable of travelling long distances overseas.

With the ancient Greeks mastering the sea, the world became a smaller place and it became possible to export and import both goods and people to and from locations, far and wide – the shipping industry was born.

Some 1500 years later, around 1200 A.D. in Hamburg, the Hanseatic League was formed. It was a commercial and defensive confederation of merchant guilds and their market towns. The League was created to protect economic interests and diplomatic privileges in the cities and countries and along the trade routes the merchants visited. The Hanseatic cities had their own legal system and furnished their own armies for mutual protection and aid - transport had become regulated and safer.

The 1800s saw the development of trains and a railway system that began to bridge the world. Trains provided fast transport for goods and people. Automobiles followed in the latter part of the 1890s, and then in 1903 the aeroplane era began with the Wright brothers' first successful flights.

Over the next twenty years or so, aeroplane development triggered profitable, rapid, commercial freight and passenger transport opportunities – fresh foods and fragile goods could be flown rapidly

from far locations to meet the demands of a public willing to use technology to satisfy their needs.

Trains, boats, cars and planes transformed our world and then, in the 1960s and 1970s much research was done into developing the disciplines that transport needed, to gain efficiencies. At that time traffic and public transport was focused on people. Logistics was a 'young' field that only referred to physical distribution and inventory management.

Then the 1980s came along, and with those years, a reliable global transport infrastructure. Operational Researchers began focusing their attention on optimising the supply chains involved in transport. Supply chain management and a more holistic consideration of factors affecting both supply chains and their environments led to 'leaner' and 'greener' supply processes.

This was also a time when the study of tracking emerged (common carriers and private fleets), and logistics became a common word in our vocabulary. It is expected that the global trend in environmental and social consciousness will continue to the point where emphasis is placed on, 'The ability to meet the logistics needs of the present without compromising the ability of future generations to meet their needs.'

There will be a systemic focus – optimisation of the entire supply chain network, not just of a part of it, and customer value co-creation. Information would be holistically shared and there would be joint interpretation and collaboration to foster further improvements. There would be more demand shaping, dynamical selecting, transformational agility, and flexible network agility. 'I believe three key words will describe changes made for the future, they are Systemic, Collaborative and Dynamic'.

Vehicle routing, facility location, production scheduling, supply chain network design, lot sizing, warehouse management are all interconnected problems.

Smart monitoring was one solution, for future distribution problems. She showed a slide of a simple distribution problem, applying traditional tools like classic inventory models, with individual times and quantities fixed. These were not efficient. It is better to move away from decisions and to look at the system from which decisions are made.

Classically each carrier optimises its capacity – but this is less

efficient than a collaborative approach and placed more strain on the environment. A collaborative approach would match customers to carriers - each carrier would have its own customers to serve, some would specialise in delivering to 'nearby' customers, others would operate more efficiently by delivering to distant customers.

There would of course be some overlap between carriers and some revenue sharing, but efficiencies would be gained and environmental impact would be reduced. With a collaboration policy in place, each carrier would gain higher profit than in the case of carriers that did not collaborate.

Professor Speranza suggested that the future lay in autonomous, electric vehicles but changing from conventional vehicles to electronic vehicles will take ages.

Before this happens, can we consider reducing the number of travelling vehicles, can we reduce congestion for a given number of travelling vehicles?

Showing a slide of a city simulation, she illustrated how a reduction in the numbers of travelling vehicles could be achieved – inputs to the model she said, were origin, destinations, request time, desired departure time and flexibility factor.

Explaining how the model worked, she said that a flexibility factor of 1 would signify that passenger desire was to travel from origin to destination directly and most rapidly, a factor of 1.1 in the model would signify those passengers who were prepared to undertake a longer, less direct journey to arrive at their desired destinations, and so on...

We could also use shortest path tools and intelligent routing to reduce congestion. Already, Google maps was she said, 'Smart enough in terms of leisure or business travel, to provide alternative routes which we can choose from whether we are walking, or driving. It can detect congestion and manage re-routing to avoid congested areas – congestion is the result of individual decisions and an intelligent routing tool can co-ordinate decisions on route choice.'

In conclusion Professor Speranza reminded us that transport technology continued to change, and there would always be a need for Operational Research expertise in this field. 'These were', she said, 'exciting times for O.R.'

<OR>

Careers Open Day 2015

Book your FREE place now!

Don't miss your chance to discover career opportunities and postgraduate options in O.R. and Analytics



Millennium Point, Birmingham

Wednesday 18 November 2015

10am to 4pm

**Find out about this year's exhibitors online at
www.TheORSociety.com/CareersOpenDay**

EURO2015-BEHAVIOURAL OPERATIONAL RESEARCH (BOR)

NIGEL CUMMINGS

Professor Raimo P. Hamalainen, Director and founder of the Systems Analysis Laboratory in the Aalto University, Finland, spoke about the need for, and recent developments in the emerging research area of, Behavioural Operational Research (BOR).



It was important to understand what kinds of behavioural biases O.R. methods cause during their problem solving processes - behavioural issues were always present when supporting human problem solving by modelling.

Behavioural effects could relate to the group interaction and communication when facilitating with O.R. models as well as to the possibility of procedural mistakes, cognitive biases and even relate to motivational issues. His research in BOR ranged from studies on how behaviour was captured in O.R. models to the means of identifying and avoiding undesirable behaviour effects.

Behavioural aspects compliment O.R. and was useful in problem solving. 'O.R. is not mathematics only, mathematics is important but it is not enough, our goal should be to help people in problem solving.'

Best practices in O.R. typically were learnt from successful case studies, but in those cases the focus was already on processes and practice, and to date, little had been done in BOR to compare practices.

Behavioural research was not new, but it had seldom been applied in O.R. prior to 2013, as few papers exist about it prior to that time. In such research that had been recorded, subjectivity was explicitly taken into account. This differed slightly in Operations Management where a need had been found to study how people acted in systemic settings.

An example is the bullwhip effect in supply chains; an observed phenomenon in forecast-driven distribution channels. It referred to a trend of larger and larger swings in inventory in response to changes in customer demand, as one looked at firms further back in the supply chain for a product. The concept first appeared in Jay Forrester's Industrial Dynamics (1961) and thus it is also known as the 'Forrester effect'.

Behavioural analysis has also been applied in finance and economics. It can deliver insight into the actual behaviour of agents in economic decision-making processes. It also provides insight into the ways people make personal investment decisions - an active research area appreciated by theoretical economists.

Embracing behaviour helped in generating theoretical insights, because decision theory was not enough to explain human choices. 'Axioms of rationality were not always followed, there were cognitive biases'.

Experimental game theory has also been very active in behavioural research - it has helped to explain how people interact, how fairness and cooperation emerge. 'Because we don't isolate our thinking into only one moment'.

Professor Hämäläinen then presented slides of an 'Ultimatum Game' that illustrated how some decision stream could be taken, and he spoke about neuro economics. 'Because emotions are needed in decision making.'

He thought the O.R. community was now ready to start behavioural research because O.R. analysts could probably derive benefit from observing and understanding the systems they examine, to improve their performance.

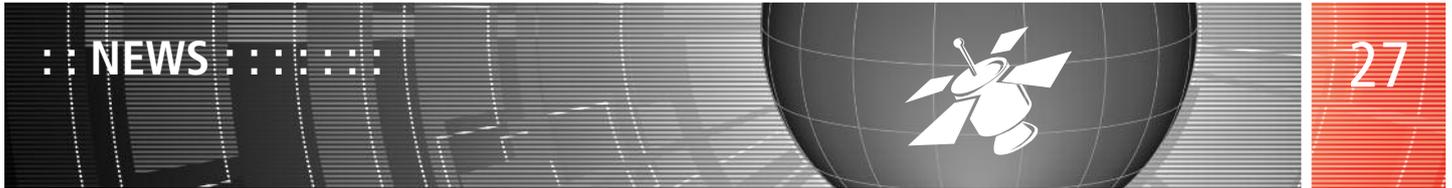
Using a systems intelligence approach researchers could successfully manage and engage with systems, and act intelligently with emotions.

He also described the use of solution awareness models, and cited Donella Meadows 'Limits to Growth' 1972 as a further reading source for gaining understanding. Agent based modelling was also discussed, and in particular how examining the characteristics of agents and how they generated macro behaviours from observed micro behaviours could provide useful insight.

'There should be a balance between mathematical and people skills'.

In closing he said, that 'ethical O.R.' should take behavioural challenges seriously as O.R. was used in the most important problems of mankind such as climate models and policies. 'When we are talking about behaviour what we are really talking about a lot, are our emotions. O.R. is about decision making and emotions play a role in decision making'.

His personal web-page can be found at: <http://sal.aalto.fi/raimo>



WOULD YOU LIKE TO GET INVOLVED IN RUNNING THE SOCIETY?

GAVIN BLACKETT, SECRETARY & GENERAL COUNCIL

The Society's General Council (GC) and various underlying committees help set the strategic direction and convert its plans into actions. GC is made up of 36 Society members, serving as representatives of the Regional Societies, a representative of the Special Interest Groups and National members. The five officers of the Society serve on GC, and together with up to six other members of GC act as trustees on its Board. Members of GC can serve up to two terms of three years.

As a result of this, GC benefits from a regular turnover in membership. The formal election notice, together with details on how to get nominated, has been posted on the website. If you'd like to get involved, the vacancies are listed below. Go online to find the documentation.

The commitment includes attending 3-4 meetings a year, and working on follow-up actions. Please get in touch with me if you'd like discuss this further.

Call for nominations

Officers of the Society to serve on the Board of Directors and on the General Council

Nominations are invited from fully paid up members of the Society for the following vacancy

Vice President †	Six sponsors
Treasurer	Six sponsors

Members of the General Council

Nominations are invited from fully paid up members of the Society for the following vacancies

Up to 3 national members †	Six sponsors each
Special Interest Group member †‡	Six sponsors
Regional member, East Midlands *†	Six sponsors
Regional member, Midlands *†	Six sponsors
Regional member, North West *	Six sponsors
Regional member, Scotland *†	Six sponsors
Regional member, West *†	Six sponsors

* Regional members must be nominated from among their own number by members within the region.

‡ Special Interest Group member must be nominated from among the SIG officers.

† Some incumbent members are eligible to stand for a second term.

Nominations must be received by the Secretary and General Manager on or before **30th September 2015**.

LATE NOMINATIONS WILL NOT BE ACCEPTED.



EURO 2015: O.R. PRACTICE STREAM – CASE STUDIES IN O.R. AND ANALYTICS

JOHN RANYARD AND SUE MERCHANT

The aim of this stream was to present case studies that have provided valuable outcomes and/or insights for the client organisation. They cover a very wide range of areas where O.R. and Analytics have been used effectively. The first session was covered last month (page 19); this month will look at sessions 2 and 3 with sessions 4 and 5 following next month.

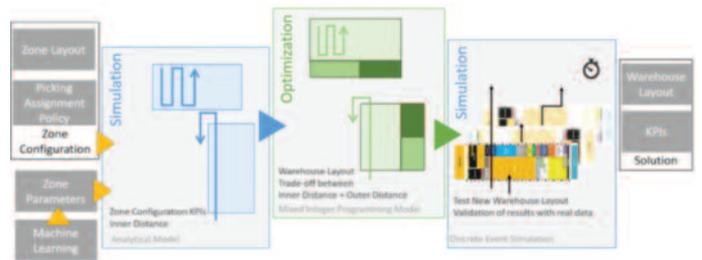
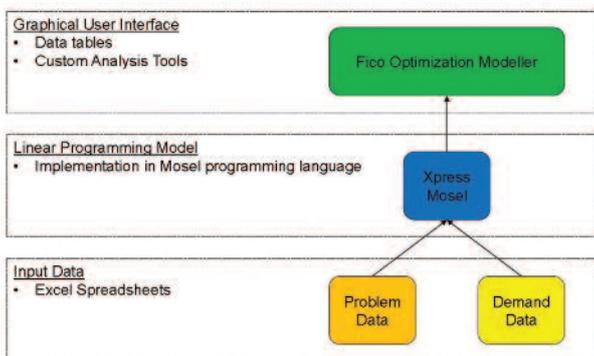


Steve Thornton of TATA Steel illustrated this concept by describing a case study -**Development of an Autonomous Systems Development Tool to Automate Scheduling of a Batch Heat Treatment Plant**. This involved initial workshops and data analysis to determine hard and soft objectives and then the development of a scheduling model plus an associated algorithm to balance softer objectives relating to delivery reliability, energy

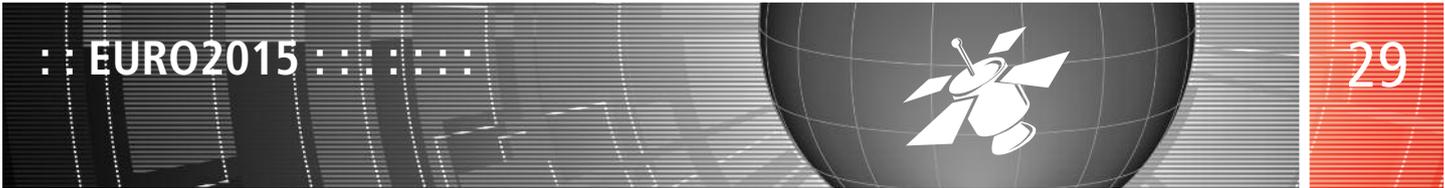
consumption and utilisation. An extended period of evaluation confirmed the value of the tool but also highlighted the continued importance of human tacit knowledge.

A second production planning study was described by Martin Dahman (Asolvo, GmbH) and Stephan Westphal (Clausthal University) - **Long-Term Planning Model for Industrial Alumina Production**. There are several successive production steps in which basic materials and preliminary products are processed in order to produce diverse final products. As any of these steps can be processed on a selection of different machines with different capacities, the planner faces many possibilities in production scheduling and machine assignment. An LP-based planning procedure was developed to produce an optimal production schedule spanning up to five years. This solution also identifies machine capacity bottlenecks. A graphical evaluation system is enabling the new approach to be tested by the client, so far with promising results.

Solution Model Architecture

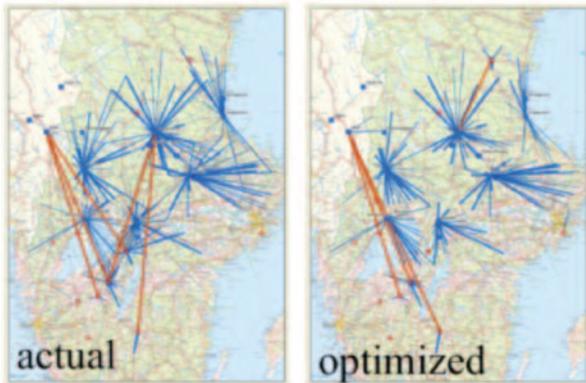


João Alves, CEGI, INESC and Oporto University, Portugal, described **Combining Simulation and Optimization to Improve Picking Performance on Specialized Retailer Warehouse**. The aim was to reduce the distance travelled by 'order pickers', so as to reduce warehouse operating costs. Two levels of improvement were investigated, item storage within each of the 5 zones and the overall layout of the zones. A novel 3-phase methodology was used. First a simulation model is used to confirm existing operating policies and viable alternatives; secondly a mixed integer optimization model is used to find the best configuration and a



storage policy for each zone and; finally the model's optimized solution is tested under uncertainty using simulation. Significant savings were identified by optimising item storage within each zone but improving zone layout will require significant investment.

Sharing on actual transports



Mikael Ronnqvist, (Département de génie mécanique, Canada) described - **How to Use Collaborative Logistics** – to reduce costs for each collaborator as well as reducing transport-generated pollution overall. While it is easy to demonstrate the potential savings through O.R. models, trust between collaborators and the safeguarding of sensitive information are key barriers, often requiring a third party to coordinate the necessary activities. Despite the difficulties, some successes have been achieved in the forestry and petroleum industries in Sweden.

response service by identifying and quantifying the factors that impact survival rates in serious incidents attended by lifeboats, predicting both the likelihood of serious incidents and deaths from activity at sea. Their stepwise multivariate logistic regression model had identified a range of factors which affect the outcome of RNLI services, such as wind, the type of incident, sea water temperature, visibility and response time. A computerised model was now being developed to assist with deployment decisions and strategic planning. GIS data is also being used to plot a range of coloured maps indicating where risks occur and from what source e.g. diving from boats, kayaking, falling from cliffs.

2009 Fire Formulae

$$Y_{Fire} = \left\{ \text{Scale} \times X_{Area} \left(4.6998 + 0.7788 \frac{X_{Coast}}{Pop_{2009}} + \right. \right.$$

$$\left. \left. 0.233 \left[\frac{X_{Ck} - 0.1929}{0.0682} \right] + \frac{X_{Ho} - 0.7214}{0.0406} + \frac{X_R - 0.2571}{0.0657} \right) + \right.$$

$$\left. \left(\frac{X_{Ab} - 21.6666}{1.3578} \right) + \left(\frac{X_{Av} - 2.2578}{0.1389} \right) + \left(\frac{X_{Ac} - 0.0211}{0.0111} \right) \right\} +$$

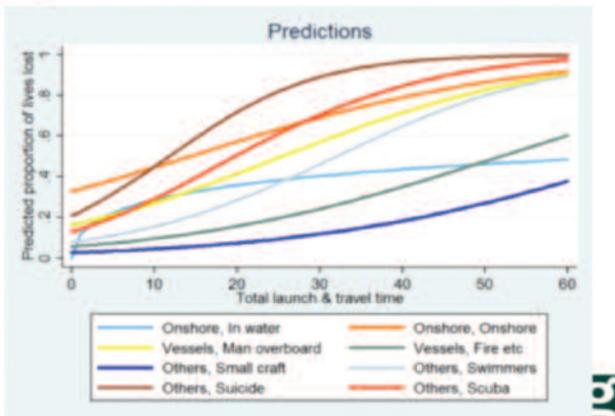
$$\left. \left. \left. \left. \frac{30669.492300}{Pop_{2007}} \left[\frac{X_{Comah}}{Pop_{2004}} + \frac{865.2528}{Pop_{2009}} \right] + \frac{X_{BuildRisk}}{Pop_{2004}} \right) + \right. \right.$$

$$\left. \left. \left. \left. \frac{0.4132}{Pop_{2007}} \left[5X_{Primary2004} + \frac{X_{ACORN\ risk}}{X_{ACORN}} Pop_{2004} + X_{Pop_{2004} \geq 65} \right] \right) \right\} \right\} -$$

$$0.00044940954747$$

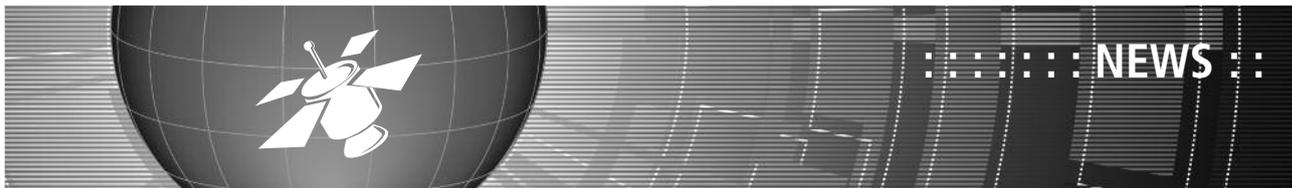


Example results for time (mins) to reach casualty



Joe Breen, Cath Reynolds and Russell Hocken, RNLI, and Michael Wright, Greenstreet Bergman Ltd, gave a fascinating talk on **Using Regression Analysis and Modelling to Underpin Lifesaving Interventions**. The aim was to improve the RNLI's

Paul Hewson from Plymouth University - **Construction and Evaluation of Spreadsheets Used in Government Funding Formulae** - described how he had tackled a tricky job to audit the national police funding formula on behalf of The Rural Services Partnership who were anxious to establish that rural regions were not disadvantaged by the formulae. Paul explained first of all how the police and fire funding formulae operated and described how he had used simple O.R. testing methods to try to find flaws in the way the formula worked. Paul also commented that it is believed that around 80% of spreadsheets contain errors of one sort or another but that with careful design (e.g. using software quality processes during design; checking using ranging and simulation) many of these can be avoided– this gave us all food for thought!



WILL STATISTICS AND O.R. BE DEAD BY 2050?

BY TONY BENDELL, CHAIR OF THE QUALITY IMPROVEMENT SECTION OF THE ROYAL STATISTICAL SOCIETY

Interestingly, and perhaps ominously, there are members and Fellows within both the Royal Statistical Society and the Operational Research Society who are currently questioning the same thing. Is the writing on the wall for our disciplines, and by implication our professional societies?

The trend for the new generation of data and analytical professionals to not identify as either Statisticians or as Operational Research analysts, does not appear to be abating despite both societies claiming that Big Data and Analytics represent an unprecedented opportunity for their disciplines.

It can well be argued that such mismatches between the perspectives of the established institutions within society and an emerging generation of new professionals is itself an indicator of shifting sands, of emerging practice that will change for ever the status quo that those institutions within society represent. Is this happening? And if it is, is it irreversible?

If it is, then if we don't successfully recruit the next generation of professionals into our named disciplines then it is our disciplines that lose out, not only suffering from reduced numbers but also from the competition that the emerging group of professionals then represent. This is a real threat, as by definition they are simultaneously both more relevant to current thinking and needs, and less encumbered by the thinking, traditions and infrastructure of the old disciplines which, if they do not successfully and speedily evolve, must be less relevant today than when they were created.

Learned and professional societies such as ours originated in a world which, compared to the one we inhabit today, was slower and

less connected. The societies therefore fulfilled a crucial function, unifying members, providing access to information, peer review and discussion with likeminded professionals, as well as professional status.

But the world has changed. The trend worldwide may be to diminishing attendance at local professional group meetings and a greater use of the worldwide web to provide up to date information. Social media resources are now where we debate, so why should a new generation brought up on transient association with a virtual group on an as-needed or as-interested basis bother about joining a professional society, especially if the society's defining discipline no longer directly matches the perceived need in society and within that new generation?

This is something that both societies should debate, and they are together at the RSS at Errol Street in London on 4th December. The meeting is organised jointly by the Quality Improvement Section of the RSS and the ORS, with senior participation from both societies, including the President and Vice President of the OR Society.

This is a topic of great importance to all of us, so reserve the date in your diary now, and come along and have your say.

<OR>

NEWS OF MEMBERS

The Society welcomes the following new members,
 NICOLA AGIUS, Kent; ANNE-SOPHIE ALLOUIS, Hertfordshire;
 ALISON BERRY, Salisbury; RICHARD BROADBENT, Hants; DEBRA
 CHARNLEY, Cheshire; DANIEL HARVEY, Hertfordshire; PETER MILES,
 Cheshire; JAMES SCOTT, Birmingham; CHARLOTTE SIMMONS,
 Hants; ROSANNA TULLOOCH, Bristol;

and Reinstated members,
 ELEANOR CHRISTER, Hants; JACKIE DOBRIN, North Fambridge;
 RICHARD RICKARDS, Kent;

and the following student members,
 FRANCIS ANDEM, University of Uyo Nigeria; JOANNE CHEW,
 Australia; SAM HEPENSTAL, University Southampton; OLIVER
 IBARRONDO, Spain; RAHUL MITTAL, University of Exeter; SUDABA
 MOHAMMED, University Birmingham; ALINA PATELLI, Birmingham;

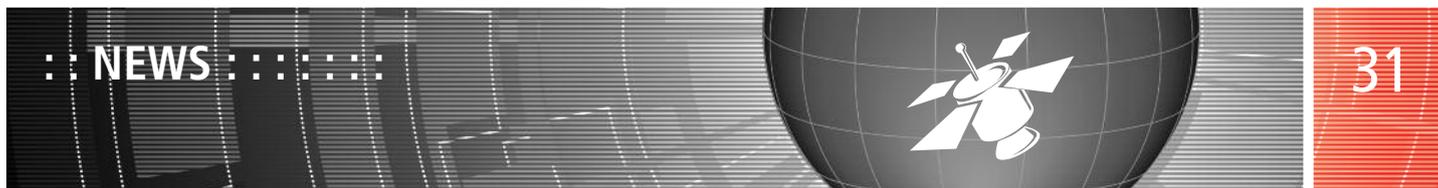
Total Membership
2768

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 AFORS (Associate Fellow)
 John WHITTAKER

Admit to the category of FORS (Fellow)
 Tim PIGDEN
 Simon MARTIN
 Alexei BOTCHKAREV

<OR>



MY FIRST O.R. PROJECT

RICHARD EGLESE

My first O.R. project as a practitioner took place in 1973 when I started work as a member of the British Rail Operational Research Division.

I had already had some experience of undertaking an O.R. project for a client through my Masters course at Lancaster University, when I was involved in developing a simulation model to help determine how many police patrol cars were needed in a district in Birmingham – but that's another story.

The British Rail Operational Research Division then occupied offices at London's King's Cross station. These were before the days of Harry Potter and Platform 9¾. Our offices consisted of a series of rooms above Platform 1 stretching down one side of the station. When I joined, an IRA bomb had recently gone off in the station, injuring 5 people. On the TV, a new BBC sitcom called 'Last of the Summer Wine' was about to start its first series.

My first project involved scheduling the dates for major service maintenance of locomotives. The issue was that if locomotives were scheduled for maintenance simply according to their due date, this could result in unacceptable peaks and troughs in the workload through the engineering facilities and also in the budgetary requirements. The objective was to smooth the repair budgets as far as possible, subject to the amount of tolerance that the engineers deemed was acceptable for the maintenance to take place.

This was not a brand new project: it had already been started by a colleague a few years senior to me and my job was to take over the computer programme that had been developed so far for diesel main line locomotives, extend it to deal with other types of locomotives and to provide the sort of output and monitoring that the management wanted.

The algorithm at the heart of the computer programme had already been developed by the time that I arrived. This was essentially a heuristic procedure. It had been recognised that the problem could have been formulated as an integer program, but the size of the problem (including all locomotives and looking over a ten-year time horizon) meant that using mathematical programming software was thought to be impractical. I'm not sure whether that would still be true today with the advances that have occurred in both software and computing power.

Developing the computer programme for use by management presented some practical problems. These were the days long before microcomputers were available on desk tops. In order to develop a computer programme, we had to make use of facilities outside our King's Cross offices. One option was to walk down the road to Gordon Square, where we could use the London University Computing Service (LUCS) operating a CDC 6500 mainframe computer. Our jobs were usually written in Fortran code on punched cards. After submission, we would wait for anything between half an hour or half a day to pick up our line printer output, depending on the size of the job and the demand on the computer.

However for finally developing the smoothing programme, the LUCS

option was not possible. This was because the data containing the maintenance details and history of the locomotives was kept on a magnetic tape used on the IBM mainframe owned by British Rail located at Derby. I could travel up to Derby (by train of course) and work in an office there, but because of the need to use the magnetic tape, I could not guarantee getting more than one run per day, which was usually done overnight. So much of this phase of development of the programme involved me phoning one of the computer staff at Derby in the morning to see if there was some line printer output ready for me from the previous night's run. If the output was just a few lines containing an error message, then I could sometimes work out what had gone wrong and ask for some of my punched cards to be replaced and get another run in. My hope was that there would be several pages of line printer output (one page summarising the details for each locomotive) that I needed to check to make sure everything was correct and whether any further changes were needed. This output would be put in a large envelope and sent using the British Rail internal mail service from Derby down to me at the King's Cross offices.

I soon learned that if I waited for the envelope to arrive on my desk, I might have to wait for 24 to 48 hours after it was sent, due to the vagaries of the internal mail service. However, if I knew what train the envelope had been put on at Derby, I could walk across to St. Pancras station at lunch time and meet the train as it arrived. I could then go to the guard's van and pick up my output. During the afternoon I could check the output and if further changes were needed, I could ring up Derby and ask them to make the necessary changes to the punched cards and get another run of my programme over night. The next morning would see the sequence repeat.

Subsequent projects at British Rail did not have the computer issues of needing to use a data tape at Derby, so simulation models of maintenance works and of the new Selby coalfield terminal (as it was then) were developed more easily using the facilities at LUCS. But compared to the facilities that are now available for developing computer applications for our O.R. models, I feel that I am looking back on a different world.

Over my time as a practitioner at British Rail, I learned that an important and time-consuming part of a project concerned finding out about the problem that had been identified and modelling it in an appropriate way. Implementing the results of a model or providing a computer programme that could be used effectively and handed over to users also required much time and effort. The models themselves were a vital component of the work we carried out, but were of no use unless the problem specification and implementation phases were not done well. Despite the major changes in computing and communication technology since 1973, these lessons are still relevant today.



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

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.

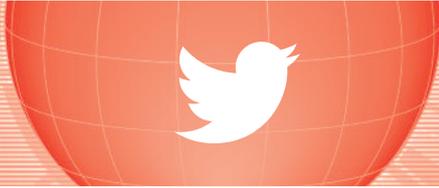
(Title and abstract to be advised.)

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



SOCIAL MEDIA MONTHLY FAVOURITES



What's hot on Twitter from @TheORSociety community of 1,634 followers...

<p>Frances Sneddon @FrancesSneddon Jul 14 Prof Eva lee 'if you say real time you better mean real time, 50 mins is too long' ha yes, totally yes! #Healthcare #euroconf2015 #orms</p>	<p>Voluntary Action Fund @volactionfund Jul 14 @KeithWimbles Excellent discussions today on Grand Challenges for society and the role of OR in addressing them. @euroconf2015.</p>	<p>EURO2015 Glasgow @euroconf2015 Jul 14 Did you know @TheTonyO has a CBE for his contributions to the UK government #euroconf15</p>
<p>EURO2015 Glasgow @euroconf2015 Jul 15 If you weren't able to get to the careers expo you can contact exhibitors via mai- euro@theorsociety.com #euroconf2015 #orms</p>		<p>Zehra Kamisli Ozturk @zehrakozturk Jul 15 Amazing plenary #transportation #optimization @euroconf2015 #GraziaSperanza https://twitter.com/euroconf2015/status/621259014651965440 ...</p>
<p>Laura McLay @lauramclay Reading about modeling cyclist power by @JFPuget: https://www.ibm.com/developerworks/community/blogs/jfp/entry/Modeling_Cyclist_Power?lang=en ... #qs #optimization #orms #thisisor #iot #sensors</p>	<p>Jeremy Wilshere @JMPW Aug 6 @bluecombats @TheORSociety OR was born in a genealogical neighbourhood with scary IQ. Too elliptical still? "bil" = brother-in-law etc...</p>	<p>Felicity McLeister @FMcLeister Aug 15 #ProBonoOR has completed 33 projects since starting @TheORSociety</p>

Who the OR Society is following on twitter:

 <p>Melissa Moore @mooremm UMBC Research Park</p> <p>Exec Dir, INFORMS, leading association of professionals in OR and Analytics. Dedicated to advancing the knowledge, research and application of OR and Analytics.</p>	 <p>Nigel Lewis @NigelLewisCC London</p> <p>Head of Business Analytics, Capgemini Consulting UK</p>
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The OR Society on LinkedIn: join the 3,500 members who do so ...

 <p>Vehicle routing problem Jeff Jones, Website Editor at O R Society</p> <p>There have been new papers posted on the ORSoc website, in the sections on Methods and Applications. Most importantly, an extension to the Vehicle Routing Problem, dealing with broken down vehicles.</p> <p>The article is at: www.theorsociety.com/Pages/ORMethods/VehicleRoutingProblem/VehicleRoutingProblem.aspx</p>	
 <p>The i-test, something ever good analyst should know about Gillian Groom Technical Training Specialist at Minitab Ltd</p> <p>Gillian has been reading about the use of the i-test in statistics. She writes "I had never heard of it, but now realise how essential it is in an analysts tool kit". http://blog.minitab.com/blog/fun-with-statistics/combining-tools-of-the-past-and-present%3A-the-i-test</p> <p>Gillian asks: <i>Have you heard of it? Are you unknowingly using it?</i></p>	

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

TWO BIRDS, ONE STONE

LOUISE MAYNARD-ATEM

I think we probably all have specific techniques that we favour for specific types of problems, and it can sometimes be quite difficult to disassociate one from the other.

For example, whenever I'm faced with a XX problem, I would immediately jump to YY to come up with my solution. This is perfectly natural and is probably influenced by previous experience and/or the way we were taught. In this month's article I want to take a technique that has a particularly obvious application (for me at least) and see how it can apply to another, seemingly different situation to illustrate the point that techniques can have both obvious and less obvious applications. Perhaps the title should have been two problems one technique, but I felt that was a little less catchy!

My technique of choice this month is survival analysis; not a technique I've used in any great detail, but one that has always interested me and one that I think can be applied in a number of different situations.

Have you used survival analysis in scenarios other than the ones described below or other examples of two different problems being solved using the same technique? 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), or tweet me @LMAtem.

What is Survival Analysis?

Survival analysis is generally defined as a set of methods for analysing data where the outcome variable is the time until the occurrence of an event of interest. The event can be death, occurrence of a disease, marriage, divorce, etc. The time-to-event or survival time can be measured in days, weeks, years, etc. For example, if the event of interest is heart attack, then the survival time can be the time in years until a person develops a heart attack.

The two key terms used in survival analysis are **Time-to-Event**: the time from entry into a study until a subject experiences a particular outcome, and **Censoring**: subjects are said to be censored if they are lost to follow-up, drop out of the study, or if the study ends before an outcome of interest has occurred.

In survival analysis, subjects are usually followed over a specified time period and the focus is on the time at which the event of interest occurs. *Why not use linear regression to model the survival time as a function of a set of predictor variables?* First, survival times are typically positive numbers; ordinary linear regression may not be the best choice unless these times are first transformed in a way that removes this restriction. Second, and more importantly, ordinary linear regression cannot effectively handle the censoring of observations. *Why not compare proportion of events in your groups*

using risk/odds ratios or logistic regression? Both such techniques ignore the key component of the analysis, time.

There are a number of ways of describing survival distributions including using the following functions described below and illustrated in Figure 1:

- **Probability density function** – is a function that describes the relative likelihood for a random variable to take on a given value. The probability of the random variable falling within a particular range of values is given by the integral of this variable's density over that range.
- **Survival function** – the goal of survival analysis is to estimate and compare survival experiences of different groups; survival experience is described by the survival function.
- **Hazard function** – this is the ratio of the probability density function to the survival function.

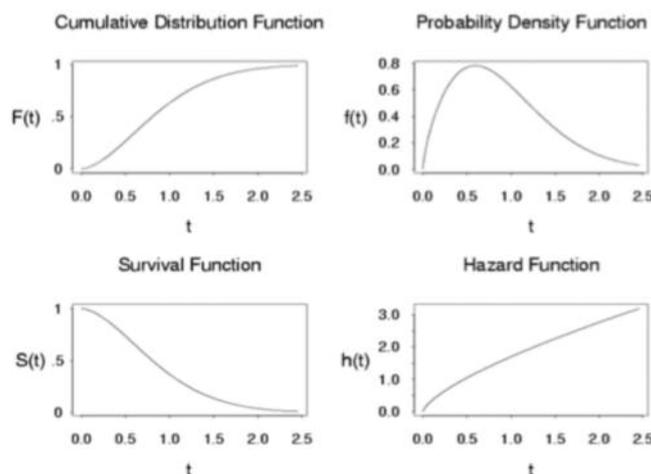


Figure 1: A possible set of probability density, failure, survival, and hazard functions.

Case Study 1 – Aspirin, ibuprofen, and mortality after myocardial infarction

Survival analysis is typically used to investigate just that – survival. Curtis et al¹ investigated whether or not prescribing aspirin and ibuprofen to patients being discharged after myocardial infarction was associated with the increased risk of death. There is some evidence that ibuprofen blocks the cardio-protective effects of aspirin in these cases.

A total of 70,316 patients were prescribed aspirin at discharge from hospital; 66,739 were prescribed aspirin alone, 844 aspirin and ibuprofen, and 2733 aspirin and other non-steroidal anti-inflammatory drugs (NSAID). Totals of 11,546 (17.5%) patients who were prescribed only aspirin, 118 (14.0%) who were prescribed aspirin and ibuprofen, and 432 (15.8%) who were prescribed aspirin and other NSAID died within a year after discharge. The survival analysis carried out (results of which are shown in Figure 2) found that patients prescribed aspirin and ibuprofen on discharge had a risk of death that was comparable to that of patients prescribed aspirin alone or prescribed aspirin and another non-steroidal anti-inflammatory drug.

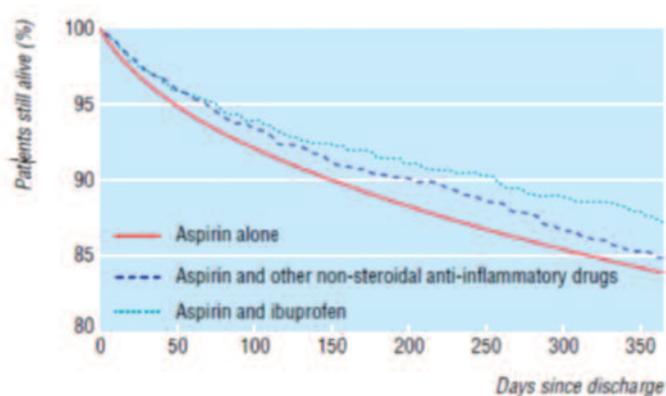


Figure 2: Survival curves for elderly US survivors of myocardial infarction prescribed aspirin alone, aspirin and ibuprofen, or aspirin and a different non-steroidal anti-inflammatory drug on discharge from hospital.

It was recognized that this was a non-clinical trial and that it was perfectly feasible that some of the patients may have bought their own ibuprofen (over the counter) or, indeed, not taken what was prescribed to them.

The context of this study was based on reports made by investigators, claiming that patients with established cardiovascular disease and were prescribed aspirin and ibuprofen on discharge were at increased risk of death compared with patients who were prescribed aspirin alone². These claims (based on a study of 187 patients) prompted recommendations against patients with coronary disease using ibuprofen. The results of the analysis within this paper showed that patients taking aspirin and ibuprofen have similar mortality to patients discharged on aspirin alone.

The original paper is very short and is likely to raise more questions than it answers see reference below.

Case Study 2 – Modelling Customer Lifetime Value

Junxiang Lu used survival analysis for an application in the telecommunications industry³; the objectives of the study were to develop the concept of customer lifetime value in the telecoms industry, and to demonstrate how survival analysis techniques can be used to estimate customer lifetime value.

The paper focussed on the concept of customer survival/churn. In the telecommunications industry, the broad definition of churn is the action that results in a customer's telecommunications service being cancelled. In this study, both service-provider initiated churn and customer initiated churn were included. An example of service-provider initiated churn is a customer's account being closed because of payment default. Customer initiated churn is more complicated and reasons behind vary from customer to customer. Customer survival is the opposite of customer churn.

The survival and hazard functions (shown in Figure 3) were used to describe the status of customer survival during the tenure of observation. The survival function gives the probability of surviving beyond a certain time point t . The hazard function describes the risk of event (in this case, customer churn) in an interval time after time t , conditional on the fact that the customer has already survived to time t ; in light of this the hazard function is more intuitive to use in survival analysis.

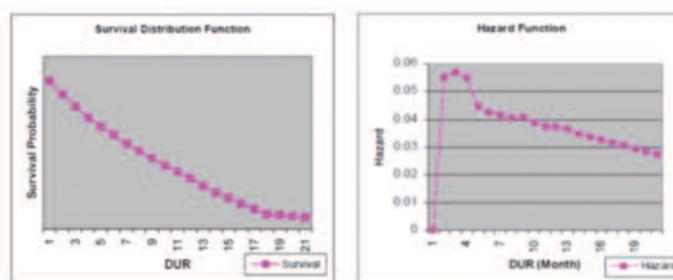


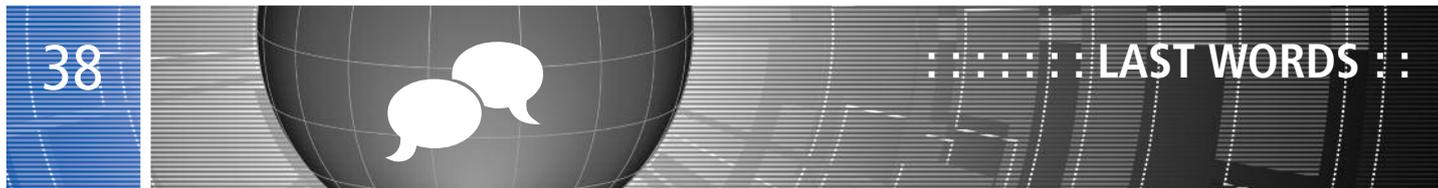
Figure 3: Customer Survival Function (Left) and Customer Hazard Function (Right).

The purpose of estimating customer survival function and customer hazard function is to gain knowledge of customer survival/churn hazard characteristics. The results of the study showed that the net present value of customers calculated profit over a certain number of months, using survival analysis techniques. Customer lifetime value is a powerful and straightforward measure that synthesises customer profitability and churn risk at the individual customer level. For existing customers, customer lifetime value can help companies develop customer loyalty and treatment strategies to maximise customer value and retention. For newly acquired customers, customer lifetime value can help companies to develop strategies to grow the right customer-base. You can read this article in full online also.

1: *Aspirin, ibuprofen and mortality after myocardial infarction: retrospective cohort study*, Curtis et al, *BMJ*, Vol. 327, **December 2003**

2: *Effect of ibuprofen on cardioprotective effect of aspirin*, MacDonald et al, *Lancet*, Vol. 361, **2003**

3: *Modelling Customer Lifetime Value Using Survival Analysis – An Application in the Telecommunications Industry*, Junxiang Lu, **2003**



OR-30

September 2015

The 'OR -30' article which appeared in August 2013 referred to the first conference on 'Systems in O.R.'. The follow-up conference on a similar theme 'Systems Thinking in Action' was held in April 1985 again at Henley Management College. The September issue of *JORS* (36.9) was a special issue dedicated to that conference and edited by Jackson and Keys. Although there is a great deal of interest in these papers, I have extracted one particular section which I feel sums up the case for soft O.R. It is taken from Checkland's paper and is his 'conclusion' which is reproduced in full below:

'If we ask what is the single most marked change in moving from the special ('hard') case of an unproblematical system which can be engineered to the general ('soft') case of an issue-based situation in which accommodations must be sought, it is probably best thought of as the shift from thinking in terms of models of (parts of) the world to models relevant to arguing about the world. Applied social science (which intervention in human affairs is bound to be) normally has to deal in the latter. It is interesting to note how clearly Keynes saw this in the case of economics. He put it to R. F. Harrod in 1938 during the discussion of the latter's presidential address to the Royal Economic Society:

'It seems to me that economics is a branch of logic, a way of thinking; and that you do not repel sufficiently firmly attempts... to turn it into a pseudo-natural science. . . . Economics is a science of thinking in terms of models joined to the art of choosing models which are *relevant* to the contemporary world. It is compelled to be this, because,

unlike the typical natural science, the material to which it is applied is, in too many respects, not homogeneous through time'³² (*italics added*).

Everything said here about economics applies with equal force to management science. Valiant efforts have been made to 'turn it into a pseudo-natural science'. The result has been useful models of *one aspect* of situations arising in human affairs, namely their logic. But these models tend to pass by the humanistic content of human affairs, namely their issues. Because the material to which management science is applied 'is, in too many aspects, not homogeneous through time', we need the extension of 'hard' systems thinking which the 'soft' tradition is beginning to supply. It will help us to be better armed, intellectually, to face the problems of the 1990s.'

This issue also included papers by: Chapman (et al); Bell and Parker; Preedy and Bittlestone; Stainton and Stainton; Stainton (R.S); Eden; Checkland; Richards and Gupta.

There is also a very full introduction by the editors (Jackson and Keys) which gives an overview of each of the papers presented. The full set can be found on the website in the archives their references are [jors1985140a.pdf](#) to [jors1985150a.pdf](#)

Checkland, P. (1985), From Optimizing to Learning: A Development of Systems Thinking for the 1990s, *JORS* 36.9 pp 757-767 ([jors1985141a.pdf](#))

<OR>

OR-20

From the President

Never mind the quality, feel the width

My involvement with the working party looking at professional qualifications and chartered status which will report early next year, has set me pondering on the need for performance measurement and how can O.R. help in setting performance measures. The two questions that led in this direction were

- a. What professional experience is required for a professional qualification and how should it be measured?
- b. What rules of conduct should be required of those in professional societies?

Having read the requirements for a professional qualification and the rules of conduct required by other professional societies, I was struck by the similarity of the various societies' rules, and by the way

they bid to finesse the real problems. Some societies are reduced to the circular requirement that 'in order to obtain the qualification they must have been working for X years at a level which is consistent with a professional qualification' – though more eloquently expressed. However one can see why over-explicit requirements will change the way a profession works and thinks of itself, as everyone tries to interpret their experiences to meet the requirements. Similarly what is the aim of rules of conduct – aspirations to aim for, or minimum standards to be observed? If the former then they cannot realistically be enforced, and yet to set minimum standards only will mean that anything not in the standard is acceptable, and could in time lead to the minimum standards becoming the norm. As Montesquieu said 'We should never create by law, what can be accomplished by morality'.

This dilemma about setting standards and the effect these standards have on subsequent behaviour occurs in many areas of today's living. The government and the public sector have picked up on the idea of performance measures, without sometimes thinking through the effect of such measures. In higher education research

is measured by four publications in three or four years. This leads to everyone ensuring they have published four papers even if it is necessary to salami-slice research into more papers than is necessary and now, to some journals producing retrospective issues on the 'Best of X over the last 20 years', so that old papers can count again. In trying to identify the quality of the papers, some people have suggested categorising the journals they appear in into A, B, C, etc. The knock on effect if this is taken as the measure of quality will be a huge increase in submissions to 'A' journals and a drop in submissions to B and C Journals, or at least a delay until they are rejected by all A journals. This can only mean longer delays in publishing research and less journals taken, neither of which is good for dissemination of new ideas. In the Health Service, setting targets for the number of episodes a hospital deals with means there is a temptation to refer patients back and forth between specialisms – each reference counting as an episode – rather than using all the hospital's resources at one time to make a complete diagnosis. When it was realised the waiting times were measured from first appointment to treatment, such times duly decreased, but partly because the time until first appointment increased. The white paper on competitiveness in industry tried to gather all the statistics in this area and use them to set targets. Again this is a worthy idea, but looking more closely suggests that it is the aspects that are easy to measure that are being dealt with and too much faith is put in numbers without looking closely at how they were gathered or what they really mean.

Performance Measurement must be an area in which Operational Research has something useful to add. Not just the mere technical areas of DEA or multi-objective decision-making which have helped considerably in developing ways of dealing with multiple and conflicting measurements, but also the 'softer' O.R. techniques that look at the holistic picture, as well as game theory which tries to look at the responses those measured will make to performance measurement.

I was disappointed recently to find a senior member of the Research Councils distinguishing Operational Research from some of the newer mathematical ideas like non-linear systems and computational modelling. Operational Research has always to be dealing with the new problems and in new ways – that is its *raison d'être*. The problem of performance measurement is one of the problems of the 90's. Let us see what new approaches Operational Research brings to it. We certainly would not want to leave it to the accountants to sort it out.

By Lyn Thomas

<OR>

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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.