



*AT THE FOREFRONT OF ANALYTICS IN AFRICA*



**ORSSA Newsletter December 2013**

[www.orssa.org.za](http://www.orssa.org.za)





# 43<sup>rd</sup> ORSSA Annual Conference

## 14–17 September 2014

An advance warm welcome to the 43rd Annual Conference of the Operations Research Society of South Africa (ORSSA)! The Conference will be hosted by the Vaal Triangle Chapter of ORSSA, and will be held at Stonehenge in Africa, just outside of Parys, from September 14th to 17th, 2014.

The conference will open with an optional tutorial on Sunday afternoon and a welcome reception on Sunday evening September 14th and will close at lunchtime on Wednesday September 17th. Participation over the full spectrum of Operations Research is encouraged, including papers of a more fundamental nature, those on the application of Operations Research techniques in business and industry, about topical issues in Operations Research, and about the philosophy, teaching and marketing of Operations Research.

The keynote speakers at the conference will be announced in due course.

Following the successful introduction of published conference proceedings in 2011, authors will again have the choice of either (a) only presenting papers orally at the conference, or (b) additionally submitting full papers (which will be pre-

sent orally at the conference) for inclusion in the peer-reviewed conference proceedings. Registration, abstract and full paper submissions will open during the first quarter of 2014.

Delegates are responsible for their own travel and accommodation arrangements. Stonehenge in Africa is recommended, as the Society has arranged competitive rates for delegates.



Stonehenge in Africa

### Important Dates

<b>17 March</b>	Early bird registration & abstract/paper submission opens
<b>11 April</b>	Abstract submission closes for reviewed papers
<b>18 April</b>	Notification of acceptance of abstracts of reviewed papers and go-ahead to submit full papers for peer-review
<b>16 May</b>	Submission of full papers for inclusion in the conference proceedings closes
<b>25 July</b>	Early bird registration closes
<b>11 July</b>	Abstract submission closes for oral presentation of all papers
<b>18 July</b>	Notification of abstract acceptance for non-reviewed papers
<b>18 July</b>	Notification of acceptance of reviewed papers for proceedings
<b>15 August</b>	Cut-off for qualification of reduced room rates at the hotel
<b>22 August</b>	Registration closes

Please visit the ORSSA website and click on the link *ORSSA 2014* for more information:

[www.orssa.org.za](http://www.orssa.org.za)

**FROM THE EDITOR**

By MARK EINHORN ([einhorn@sun.ac.za](mailto:einhorn@sun.ac.za))  
 ORSSA NEWSLETTER EDITOR



Mark Einhorn

And so it comes to pass that another year draws to a close. I hope it has been a successful and prosperous year for all our members, and that you have each been able to achieve your goals set out before you. For now though, I feel it's time for you to take some well earned time off, put your feet up, and relax, thus giving yourself the best opportunity to have a fresh crack at 2014 come January.

The highlights of this final edition of 2013 start with the last word from Jan van Vuuren as our President in his column *From the President's Desk*. The feature article is in the form of an interview with Neil Martin, which is reprinted with the permission of the kind folks over at GoCar magazine in Greece. Neil Martin is the head of the Ferrari F1 research and development team and race strategist, and is an OR graduate himself. A very interesting read indeed, and satisfying to see the potential and effectiveness of OR as well as OR itself receiving recognition. The member interview this month is conducted with Professor Barbara Swart of the Department of Decision Sciences at UNISA in which she discusses her views on OR and ORSSA among others. The issue closes with another fascinating book review by Hans Ittmann on the understanding and application of analytics.

Before I sign off for the year I would like to pay a quick tribute to our outgoing president, Jan van Vuuren. First and foremost I would like to congratulate him on a truly outstanding job over the past two years. He has without doubt moved the Society forward in all the right directions in leaps and bounds during his tenure as president. Secondly, I would like to thank him for convincing me to take the job as Newsletter editor and then for the unwavering and invaluable assistance he has offered me with the job over the past two years. On behalf of the executive committee and the members of ORSSA, I would like to wish Jan

well as he takes up the post of vice president of the society as well as all other future endeavors. In the same breath I would like to wish Hennie Kruger all the best as ORSSA president and look forward to serving under him on the Executive Committee.

It has been another thoroughly enjoyable year serving as the ORSSA Newsletter editor. I truly hope you as members enjoy reading the Newsletter as much as I enjoy compiling it. Please keep those submissions coming in thick and fast! Until next year, have a great festive season everyone! Cheers all, and enjoy the read.

Features	Page
<b>FROM THE EDITOR</b>	1
<b>FROM THE PRESIDENT'S DESK</b>	2
<b>ORSSA CHAPTER UPDATES: THE YEAR IN REVIEW</b>	4
<b>OPERATIONS RESEARCH IN FORMULA 1: AN INTERVIEW WITH NEIL MARTIN</b>	6
<b>ORSSA MEMBER INTERVIEW: BARBARA SWART</b>	9
<b>BOOK REVIEW: KEEPING UP WITH THE QUANTS — YOUR GUIDE TO UNDERSTANDING + USING ANALYTICS</b>	11

**QUERIES & CONTRIBUTIONS**

Any queries or contributions to the Newsletter are most welcome, especially article submissions. For any queries or contributions, please contact the Newsletter editor at [einhorn@sun.ac.za](mailto:einhorn@sun.ac.za).



EINHORN 2013 ©

## FROM THE PRESIDENT'S DESK

By JAN VAN VUUREN ([vuuren@sun.ac.za](mailto:vuuren@sun.ac.za))

### ORSSA PRESIDENT



Jan van Vuuren

As the year is rapidly careering to its end it is natural to look back and assess what ORSSA has achieved this past year. In fact, I would like to take this opportunity to gaze back a little further into the past, taking stock of what has been achieved during the two years of my presidential term (2012—2013) and acknowledging the challenges that face our Society in the short term.

Let me start with the challenges. Many challenges face our Society, but perhaps two challenges are the most pressing. The first of these concerns chapter activity, which is the essence of our grouping as a Society. Without such activity, the Society remains a remote entity to its members, who can then only interact physically once a year at the national conference. I believe our chapters can and should be much more active. It is easy to say that chapter chairpersons should just increase the frequency of organized seminars and other get-togethers to put right this lack of activity. Yes, I believe the chapter activities should indeed increase in frequency. But lack of frequency is not the entire problem. What it is that chapters offer to their members matters very much as well. We should ensure that chapter events are interesting and relevant to members, that members can learn and share at these events in addition to merely using these events as networking opportunities. On the one hand chapter chairpersons are all very busy with regular jobs and admittedly do not always organize as many and as engaging events as might be the case, but on the other hand, members have also become so busy that it is more difficult to attract members to chapter events. I know that this demotivates chapter chairpersons, who have experimented with many different event formats and starting times in order hopefully to discover that sweet spot in terms of member expectations. Perhaps the way forward to resolve this impasse is to hold a brain storming session involving the chapter chairpersons and the marketing manager so as to ascertain why it is that chapter events are often poorly attended and to come up with an attractive plan for chapter activity formats, frequencies and starting times in the day. I believe some of our chapters are stagnating and it has become very important to try and put this shortcoming right.

The second challenge I would like to raise is that of marketing of our profession and our Society. I believe that ORSSA has an important responsibility with respect to marketing

operations research amongst the public and also in spheres of local and national government. This is the only way in which new members can be attracted to our profession and in which we can make the public aware of what operations research can do for their companies, municipalities and country! In recognition of this major challenge facing our Society, the Executive Committee instituted a new marketing portfolio into which Dave Evans was elected this year. Dave has spearheaded the design and distribution of a questionnaire aiming to prioritize various marketing initiatives going forward, including:

- the creation of more ORSSA awareness amongst students in university departments where OR is taught and ORSSA is represented,
- the creation of more ORSSA awareness amongst students in university departments where OR is not taught but is relevant, and ORSSA is not represented,
- surveying ORSSA members to find out what they desire in terms of services rendered by the Society,
- spearheading general operations research marketing in a wide range of print media and in the private sector,
- facilitating the organisation of chapter events focused on the business sector,
- recruiting new corporate members,
- maintaining and intensifying ORSSA presence on social media such as Facebook and Twitter,
- creating ORSSA presence on online research networks such as LinkedIn and ResearchGate,
- selling operations research as a field or skill to recruitment agencies and school career guidance staff, and
- contacting business schools and technicians so as to raise the visibility of ORSSA and of operations research

to name but a few. I would like to thank Dave for heading up this initiative, and I would like to ask all members to support this initiative by contributing both your ideas and some of your free time to perform the marketing tasks earmarked in the questionnaire. Please contact Dave at [davevans@gmail.com](mailto:davevans@gmail.com) in this respect.

In addition to meeting challenges, we have also made some other very good progress in many areas within ORSSA over the past two years. Allow me to outline a few of these achievements:

- The KwaZulu-Natal Chapter of ORSSA was resurrected at the end of 2012 after many years of dormancy and is now functioning well. The chapter has put together some exciting events this year and has also managed to attract a significant number of new student members. In this respect I would like to commend the chapter chairperson, Remi Adewumi, who was responsible for getting ORSSA going in KwaZulu-Natal again. In view

of the first of the above two challenges, I count this achievement as very important, and I urge members in the KwaZulu-Natal region to support Remi in his task and to attend and contribute to chapter events.

- A good measure of interaction has also been established between ORSSA and its local sister society, the South African Institute for Industrial Engineers. This was the initiative of Elias Willemse who this year organized joint events between the two societies on chapter level in both the Johannesburg and Pretoria regions as well as in the Western Cape. I think this was an excellent idea, and clearly the chapter members agree, judging by the large turnouts!
- At the beginning of the year our Newsletter saw a very nice facelift – not only in the form of a newly designed front cover and internal typesetting format, but also with the introduction of new features (including a marvelous OR comic in each edition!). The newsletter is the publication vehicle that binds our Society together, and Mark Einhorn has done a superb job editing this publication over the past two years. I urge members to make contact with Mark at [einhorn@sun.ac.za](mailto:einhorn@sun.ac.za) and to inform him of things you would like to see in the newsletter or contribute articles on your activities as operations researchers, so that these can be shared with other members. Since 2012 the newsletter has also become virtually self-sustaining in terms of the cost of producing it, by generating advertising revenue. Congratulations on this front to the newsletter business manager, Danie Lötter!
- There has also been a significant shake-up in terms of membership management: At the end of 2012, dead leaves were trimmed from our membership tree by terminating close to two hundred memberships of people with whom we had lost contact over the years or who had fallen behind significantly in terms of paying membership dues. Whilst one does not terminate memberships lightly, I think the Executive Committee has acted both boldly and wisely in this respect, leaving us with a much leaner, healthier and more active membership database. Speaking of the database, it is worth mentioning that the Society is in the process of transitioning to a new online database which will have a front-end on the Society's website from where members will be able to log in, update their own personal information and view their membership dues statuses. Finally, a new and exciting new membership package was also designed for the corporate membership category, and we have already attracted two new institutional memberships in this category!
- After many years of embarrassing backlog in the final-

ization of the Society's financial statements, we have finally managed to bring the books up to date. The two people who made this possible were our current national treasurer, Jonas Stray, and our previous national treasurer, Marthi Harmse. Many thanks to them! I have asked the newsletter editor to resume the old practice of publishing the financial statements of the Society in the newsletter from next year onwards for the sake of transparency.

- This year saw the introduction of a new portfolio on the Executive Committee: that of Marketing Manager. This portfolio was created in view of the recognized need for improving the marketing initiatives of the Society, as explained in the second of my two challenges highlighted above. Dave Evans was elected in this position and has launched an ambitious marketing programme which is expected to come into effect in 2014.
- Upon realisation that the Society's previous recognition awards tended to go to rather senior members, a new type of recognition award was introduced at our national conference in Stellenbosch this year, namely Category IV: To a young and upcoming member for excellence in practicing OR. We also saw the first three members of ORSSA receiving this award at the 2013 Annual conference in Stellenbosch.
- In addition to the Society's premier award, the Tom Rozwadowski Medal, a further two medals were instituted this year for the two categories of our National Student Competition (the *Gerhard Geldenhuys Medal* for the best honours / 4th year project and the *Theodor Stewart Medal* for the best masters thesis). The two icons after whom these medals were named were on hand at the national conference in Stellenbosch this year to present the student winners with the first editions of the medals.
- The format of the Society's National Student Competition was also changed in 2013, requiring two finalists per category to attend the national conference in a special showcase session after which winners were selected by a panel of judges. A significant industry sponsorship was also secured to enable the four finalists to attend the conference and present their work in the special competition session, which turned out to be a very exciting conference session.

I would like to thank most sincerely each member of the Society at large and of the Executive Committee in particular who have helped to make 2012 and 2013 successful years for ORSSA, by helping to realize one or more of the above activities/achievements. The members are, of course, the

lifeblood of our Society, and the unfailing commitment to ORSSA amidst severe pressures of primary work schedules and the sheer good will towards our profession that I have seen on many occasions over the last two years from a large number of ORSSA members have been both heartening and truly inspiring. Thank you all for helping to make ORSSA a vibrant and active professional home for Operations Research in South Africa. I have thoroughly enjoyed the opportunity to serve as the twenty-eighth president of the Society! Of course, I shall not just yet be leaving the Executive Committee, as I shall be serving again as vice president next year.

Jonas Stray (of the University of Cape Town) is the only member of the ORSSA Executive Committee who will be stepping down at the end of 2013. He served as national treasurer during 2013 and I would like to thank him for his superb service to the Society in this capacity. I know you will remain an active member of our Society, Jonas! Tiny du Toit (of North-West University) has been elected as the new national treasurer from 2014 onwards. I would like to wish Tiny all the best serving the Society in this capacity. In addition to Tiny, another member will be joining the Executive Committee next year – Angela Rademeyer (of OPSI Systems) has been elected as an additional member

for 2014. I hope you enjoy a long and fruitful association with the committee from next year onwards, Angela!

Hennie Kruger (also of North-West University) has completed the first year of his presidential cycle, serving as ORSSA vice president this year. He will become the twenty-ninth president of ORSSA on January 1st, 2014 and lead the Executive Committee in serving our Society until the end of 2015, after which he will become vice president again for a further year (2016). Hennie, thank you for doing a sterling job as vice president – your advice and second opinions on many occasions were much valued and appreciated this year. I would like to wish you all the best for your term as president, and I would like to offer you the same level of support and commitment in 2014 that you gave me this year!

Finally, allow me the opportunity to wish each and every one of our members a safe, happy and peaceful festive season. I hope that you are able to enjoy quality time together with family and friends over the Christmas and New Year holiday period, and I trust that you will be able to rest adequately before the onset of the 2014 work year with all its challenges and opportunities. May 2014 be a memorable year for Operations Research in South Africa!

## ORSSA CHAPTER UPDATES: THE YEAR IN REVIEW

*By Mark Einhorn*

**I**t has been a busy year for ORSSA and its five chapters. Here is a short review about the events that have taken place over the past year, and where they took place.

We start off by looking westwards at the activities of the Western Cape Chapter of ORSSA which is chaired by Michelle van der Merwe. At the start of the year Michelle described the objective of the Western Cape as one in which she hoped it would “promote a wider knowledge of the techniques and practices of Operations Research within the Western Cape region. In line with this objective, the Chapter hosted two events during the year 2013.”

The first chapter event was held on February the 7th at the University of Stellenbosch. The subject of the colloquium was ‘Algorithms for the Train Unit Assignment Problem’, presented by Professor Paolo Toth from the University of Bologna, Italy. The Train Unit Assignment Problem consists of finding the minimum cost assignment of train units to a set of timetabled trips in order to fulfil the seat requests. Professor Toth presented two integer linear programming formulations of the Train Unit Assignment Problem and extensive computational results on real-world instances. The colloquium proved to be very successful with a large number of members attending the event. Refreshments

were also served after the colloquium during which everyone socialized.

The second chapter event was held on August 1st, at the Stellenbosch University Business School in Cape Town. This was a joint event between the Western Cape Chapter of ORSSA and the South African Institute of Industrial Engineering Operations Research (SAIIE OR) special interest group. The theme of the event was ‘Analytics in Finance’. We had two guest speakers, namely, Margarete Bester from XTranda and Marli Mostert from Principa. Margarete’s presentation focused on the critical importance of data validation for researchers and how partially incorrect/incomplete data may adversely affect analytical results. Examples from the credit risk industry were provided. Marli’s presentation focused on the principles of credit scoring and the practical application of linear programming in developing prediction models. The joint event was a huge success which members from both societies attended. Refreshments were served afterwards where everyone had the opportunity to socialize.

In addition to these two Chapter events, the Western Cape Chapter was responsible for hosting this year’s very successful ORSSA Annual Conference in Stellenbosch.

Heading further north we consider the Vaal Triangle Chapter of ORSSA, with Lischen Venter as chairperson.

North West University (NWU) hosted the chapter event of the first quarter on 13 March 2013. The Chapter vice-chairman, Fanie Terblanche presented a talk based on a joint paper with a German colleague. The title of the talk was “Alternative model formulations for improving the optimization of mine production scheduling problems” and the venue was the Potchefstroom campus of NWU. The talk proved to be a good way to raise student awareness about ORSSA membership as Fanie and Hennie Kruger used the opportunity to mention the benefits of membership to students working in the field.

For the second quarter chapter event, the chapter coordinated with NWU in order to host a workshop presented by Dr Ted Ralphs from Lehigh University in Pennsylvania. The workshop was on open source tools available for modelling and solving optimization problems and the main focus was on tools from the COIN-OR software repository. The event was held on 20 June 2013 at the Centre for Business Mathematics on the Potchefstroom campus of NWU.

The third quarter chapter event was hosted by Sasol Technology in Sasolburg on 29 August 2013. Michele Fisher, a member of the chapter executive committee and principal operations researcher at Sasol, presented a talk on the development of Operations Research Talent and her work in placing structures for talent and technology development in Sasol’s Decision Support team. The event also featured the official announcement of the Chapter’s intention to host the 2014 Conference.

The fourth quarter event will be hosted in Secunda in order to accommodate the geographic diversity of the chapter members and it will be followed by the chapter AGM in the same venue where the chapter exec for 2014 will be elected. The date of the event was yet to be determined at the time of printing.

We keep our attention focused in the north on our two Gauteng Chapters: the Pretoria Chapter and the Johannesburg Chapter. The Pretoria Chapter is chaired by Winnie Pelsler with additional committee members Nadia Viljoen, Elias Willemsse and Wilna Bean. After the success of the Analytics lecture at the conference last year, the Pretoria and Johannesburg chapters had a combined event on the 25th of October 2012. The topics were “The hype around analytics” by Hans Ittmann, “Combining analytics and Operations Research” by Elias Willemsse and “Effective analytical tools” by Bruce Bond-Mytt. The event was very well attended.

The Johannesburg Chapter is chaired by Louis Dannhauser with an executive committee consisting of Brahm Bothma, Derek Saunderson, John Dean and Ian Campbell. In addition to the shared events held with the Pretoria Chapter, the Johannesburg Chapter held a Valentine’s dinner on the 9th of February 2013 at which guest speaker, John Pelsler, the head of Airforce Logistics, presented a talk on the logistic challenges the Airforce is confronted with. A chapter event was also held on the 29th of August 2013 during which Ian Campbell, of the University of the Witwatersrand’s Industrial Engineering Department, gave a presentation on charter plane routing in Botswana.

Last, but by no means least we turn our attention eastwards to the newly resurrected KwaZulu-Natal Chapter, chaired by Aderemi Adewumi. The chapter held its first meeting in December 2012 at which a Secretary, Sandile Saul, was elected, but unfortunately he later accepted a job offer that required a transfer to Johannesburg. Luke Joel was then appointed to act in his stead. According to Aderemi Adewumi, the arrival of Elias Munapo to the Graduate School of Business and Leadership (GSBL) at the University of KwaZulu-Natal (UKZN) was a significant boost for the chapter as it provided access to the University’s business classes.

The chapter held three meetings during 2013, all at UKZN, with the following main focus points:

1. Discussion of strategies to recruit new members both in academia and industry for ORSSA and the chapter.
2. Inaugural Activities for 2013 –
  - The main activity was a seminar held in July by Elias Munapo at the GSBL which was used as an avenue to promote ORSSA to participants.
  - A public lecture on “Global optimization applied to industrial problems” by Professor Montaz M. Ali immediately after the 2013 ORSSA Annual Conference on the 25th of September 2013. It was well attended by people of business, computer science, mathematics, and engineering backgrounds. Participants enjoyed the lecture and asked a variety of questions. The event was documented by the College of Agriculture as well as the Science and Engineering Public Relation Office and later announced in the online UKZN Ndaba Newsletter .

I would like to take this opportunity to commend and congratulate all of our chapter chairs and their committees for their hard work and commitment over the past year and encourage all ORSSA members to do their best to attend the events organised by their local chapters as they provide excellent networking opportunities as well as allowing for the sharing of ideas.

## OPERATIONS RESEARCH IN FORMULA 1: AN INTERVIEW WITH NEIL MARTIN

*Interview by Dimitri Papadopoulos*  
GOCAR Magazine ([www.gocar.gr](http://www.gocar.gr))

*This interview was originally published on the website of GoCar ([www.gocar.gr/races/f1/10665,GoCargr\\_speaks\\_to\\_Neil\\_Martin.html](http://www.gocar.gr/races/f1/10665,GoCargr_speaks_to_Neil_Martin.html)) and is reprinted here with the kind permission of GoCar Magazine.*

Often a race is decided on the strategy calls. A lap out longer or an earlier call might cost a win. Creating a strategy is a very complex operation and is based on the work of people on and off the track. The man heading the Operations Research department, which has a basic task to maximize the chances for the best result, is Neil Martin. You won't find him at the track during the race. He and his team are working from the Ferrari HQ in Maranello during the race, supporting the team at the track. GoCar.gr caught up with Neil Martin to find out what his work is all about.

**Neil, you studied mathematics and computer science at the University of Southampton and your MSc paper was on risk assessment. How did you take the decision to show this MSc paper to an F1 team?**

After completing my first degree studying Mathematics and Computer Science, I undertook an MSc in Operational Research in 1994-5. As part of this MSc course I had to apply the O.R. techniques that I had learned to a real world problem.

Southampton University had set up a number of projects with high profile Companies. However I was really interested in Formula 1 and, with the re-introduction of refueling, I asked my supervisor (Prof. Chris Potts) whether if I could get a Formula 1 team to sponsor a Race Strategy project, that would be of sufficient mathematical complexity for a project? The University said "yes" so I wrote to two Formula 1 teams, and McLaren International Ltd (as it was then) replied positively.

I was supplied with some information from races, in paper format. I had to type in all of the sector times for every car, for every session, for every race event for analysis – in 1994 it was all paper timing information, OCR (optical character recognition) was only in its infancy and more trouble than it was worth.

I remember putting a model together from which it ap-

peared that teams were pitting too early: they appeared to be missing the 'free' pitstop that you got at the beginning of the race as you didn't lose time filling up with fuel.

Then for one race, using only data available prior to the race, the model showed that McLaren should have one-stopped, something that the Team had only worked out after the event. As a result, they became very interested in the whole area.

Functionality development requests soon followed and after my MSc submission and a couple of extended contracts with McLaren, I finally joined the Team as an employee in October 1996.

**Your name appeared in the press when you made a strategy call via email in the 2005 Monaco GP that helped Kimi Raikkonen taking the win. What were your feelings at that time?**

I found out on Monday after the race. A friend of mine at McLaren said "You are in the Telegraph". I thought he was just joking, however by mid-morning someone had left a copy on my desk.

I was fairly surprised, as all I had done was the same thing I'd done week in and week out for years, nothing special.

I was also bemused by how the events got reported. It was interesting, as whilst there were elements of truth in it, it wasn't exactly how I remembered the events!

**Since 2011 you have been working at Ferrari as head of the Operations Research department. Can you please enlighten us as to what your job activities include?**

I am in charge of a group that, in effect, acts as an internal consultancy to the rest of the business.

The group is composed of a balanced mix of mathematical modelling and software engineering. We look at various areas of the Company to assist where we can by observing the current process or activity in place, modelling it and then, where appropriate, optimising or putting new understandings, processes or software in place to improve it.





In the foreground sits Neil Martin, Ferrari's Head of Operations and Research.

**You have been involved with F1 since 1996. Can you please explain how the strategy tools and strategy calls in general have evolved since then?**

In 1995, as a student, I created my first algorithms — it was a single car, single track, with parameters of weight effect, fuel load, fuel flow time, pitstop crew time, pitlane time loss and tyre degradation. Essentially it answered the question: Is Strategy A quicker to the end of the race than Strategy B?

It was a stand-alone application which was run pre-race by Race Engineers at trackside.

Numerous feature request enhancements were then incorporated. However, the next big breakthrough was the use of Monte Carlo techniques in 1998.

This allowed us to consider all cars in the race, traffic patterns, safety cars, overtaking and other random events. The results were interesting, because when we move into the stochastic world we produce outputs like: If we undertake a 2-stop strategy we give ourselves approximately 20% exposure to finishing 1st or 2nd, but if we get stuck in traffic, we will most likely finish 7th or below. However, if we undertake a 1-stop strategy we will most likely finish in 3rd or 4th position, but are unlikely to finish as high as 1st or indeed as low as 7th. So for the first time from the

simulation we could visualise the risk associated with each option, and therefore a Team's appetite for risk could be taken into consideration.

Whilst it was a huge step forward, by embracing risk we blurred the lines: Before that the Engineers received the result of "a 1 stop is quicker than a 2 stop" which seemed more clear cut, if somewhat crude.

Up to this point, all of the development was still offline and analysis was carried out pre-race. There were no data feeds that we were able to use to run real-time, other than manually typing in the time gap to the car of interest on each lap so as to determine whether we were ahead of or behind our predicted schedule.

Soon I had written so much software that the trackside engineers wanted someone to travel to races to run some of it, so that became me. In 1999 there was no strategy audio communications channel to the pitwall, only paper printouts. I would run across to the pitwall from the garage, printouts in hand, and shout in their ears above the car noise, trying to illustrate one point or another.

Over time more tools matured, they were networked and improved trackside operational awareness and execution.

The next moment that we were able to make a leap, was in 2001 when the FOM first provided electronic timing data for all cars, live during sessions. This enabled in-race strategy to be undertaken in a more robust way. New screens were developed to take advantage of this real-time information. Furthermore, it allowed us to run real-time Monte Carlo simulations to answer questions like: 'Given the race information to the current lap, what is the best action to undertake if our competitor executes a 3-stop strategy?'; 'What is the best strategy for our competitors to use?'

The next evolution was remote working from the factory, an Operations Room or Remote Garage with people monitoring various aspects of car performance, all communicating via intercom to trackside. From there, the amount of data available has increased, the model fidelities have continuously improved and general organic growth has occurred in the area.

### **What is the general preparation procedure leading up to a race weekend?**

A week prior to the event the preliminary analysis is compiled with a view to setting the scene and our expectations for the race. This normally results in one or two candidate strategies.

Then we collect data from Free Practice 1 & 2 and update our expectations based on the information collected. This information on us and our competitors not only allows us to plan for the race, but also for qualifying strategies.

On Friday we run a lot of simulations to determine how other teams are likely to approach the race given their specific strengths.

Saturday, we use to confirm the data collected from Free Practice 3, and at this time we also finalise the Qualifying cut-off time expectation, for the bottom cars.

After qualifying, with the additional information of grid positions, we are back to running simulations to understand what our expectations are, and indeed what our risk profile going into the race should be. We analyse the likely traffic patterns and go through a number of candidate scenarios.

A strategy meeting is held with the trackside team on Saturday evening. In the first meeting on Sunday, we finalise these plans and options with the drivers to ensure that everyone knows what we need to do and the likely outcomes.

### **Are numbers always telling the truth or is "gut feeling" sometimes stronger ?**

In the very beginning, when I was the 'new kid with numbers', people with years of experience – who were mainly on the pitwall and were at the top of the Company - would remember a certain set of criteria at a certain race and cite this as the reason why the new methods were about to fail.

Atypical events will, by definition, happen from time to time and it is this information that people tend to remember – especially if in that given race you had a bad result as a consequence.

It didn't take long after me consistently saying to them "You can do this, but the likely outcome will be X or Y", with those outcomes subsequently coming to pass, before they eventually embraced what the numbers had to say.

Overall, a healthy level of scepticism is good to keep us all on our toes and to stress test the solutions, but flawed logic rarely wastes my time these days.

### **What are the nightmares of a strategist, the unknown factors that make the difference in the end?**

Sometimes knowledge is no defence. You can see a situation developing, predict it perfectly, but at the same time you know even if you make the best calls, you are destined to lose places due to various parameters beyond your control.

### **In terms of strategy analysis, how far ahead are the top competitors today?**

I'm sure each team has its own bespoke performance indices which cover drivers, tyre types, chassis, circuits types, etc. Overall metrics of this nature are a little too cumbersome to quote and be of any genuine use. They can also be misinterpreted or not fully understood.

### **In order to create a strategy module, the vital part is to gain data. How many Mb of data are you getting out of one lap and now many sensors are used to collect the data?**

It depends on what level you wish to consider your strategy. Superficially, and surprisingly, you need very little data real time; you can get away with just a laptime for you and your competitors.

However, access to sector times (3 per lap) provides a team with better fidelity, and if we consider GPS at 5HZ for all cars then you can do a better job again. This all equates to

about 1Mb per lap of information. If we now include access to data on our own car, the data rises to approximately 10Mb per car per lap.

**What does it take for you to leave the office after a race weekend as a happy man, besides a win of course?**

I'm guessing that a 1-2 isn't the answer you are looking

for! I think I have lived motor racing professionally for 19 years, and at that point your mood does tend to be affected by your on track performance.

However, knowing that we have worked to the best of our ability as a Team, right across a Race Weekend is also important: providing clear, timely and accurate assessments of situations, options and risks; and facilitating the best possible decision making.

## ORSSA MEMBER INTERVIEW: BARBARA SWART

*Questions by Mark Einhorn*

**B**arbara Swart is currently Professor of Decision Sciences at the University of South Africa (UNISA). After meeting her at the recently held ORSSA Annual Conference in Stellenbosch, she graciously agreed to an interview to share some of her thoughts on Operations Research and ORSSA as well as give us an insight into some of her academic interests.

**Thank you very much for agreeing to this interview, Professor. Let me start by asking when and how you first came to hear of Operations Research?**

When I was a student, and that is a very long time ago, Operations Research was not well known at all. I studied mathematics, applied mathematics and physics at the University of Pretoria (UP) in the 70s, and completed my PhD in 1983 while working at NRIMS at the CSIR. There I met people like Theo Stewart and Hans Ittmann, but I only really became aware of an area called "Operations Research" in the late 80s. I always worked in "pure" mathematics, and later turned to financial modelling while teaching at UP.

**You currently work in the Department of Decision Sciences at UNISA. Can you give us a brief overview of your role in the department?**

The Department of Decision Sciences is a very interesting department, with a mix of mathematicians, physicists, statisticians, and operations researchers. I joined the department in 2004 to help establish the field of Financial Mathematics and over the last few years I have helped to build the post-graduate programme as well as research capacity in Financial Modelling.

**Working in the Department of Decision Sciences at UNISA, there must be an overlap with Operations Research? Is this the case?**

Well, yes, in the sense that decision-making and optimisation play a big part in the financial world. One of the

fundamental topics in portfolio theory has been that of maximising returns and minimising risk, for example.

Only when I joined the department did I start to talk to and listen to operations researchers, and realised what the field now encompassed. There is a lot of scope for interdisciplinary work. But I still consider myself a mathematician, with an interest in many subfields including financial modelling.



**EURO mini-Conference**  
on Optimization in the Natural Sciences  
Aveiro, 5th-9th February 2014

We announce the **EURO mini-conference on Optimization in the Natural Sciences** which will be held at **University of Aveiro (Portugal)**.

**February 5-9 / 2014**

Researchers and practitioners working in the areas of **Computer Science / Optimization / Statistics, and Physics / Chemistry / Biology / Medical Sciences** are encouraged to take part in this conference.



**EURO**  
The Association of European Operational Research Societies

**EUROPTC**

### In your opinion, what role does Operations Research and ORSSA have to play in South Africa?

Listening to talks at ORSSA conferences, to colleagues and people like Theo Stewart, clearly a very important role. But I think there is still not enough knowledge about Operations Research in South Africa. We regularly get requests from students who want to study OR under the impression that it has to do with medical research or work in a hospital operating theatre.

### You recently attended the 42nd annual ORSSA conference in Stellenbosch. What were your impressions of the conference as a whole?

The conference was most enjoyable. I found the talks interesting, even though I really am a bit of an outsider to the OR world. I attend conferences such as this to get new ideas, learn and be intellectually stimulated.

### You presented a talk at the conference on the application of information theory in financial modelling. First off, may I ask you to give a brief background as to what information theory is for our readers who were not at your talk?

Claude Shannon worked in the field of communications systems and was the originator of information theory in 1948/9. Information theory provides an unambiguous, unique criterion for the amount of uncertainty in a probability distribution.

The basic ideas are as follows: Consider a random experiment with sample space partitioned into mutually exclusive events  $E_1, E_2, \dots, E_n$  with associated probabilities  $p_1, p_2, \dots, p_n$ . We want to assign a measure of uncertainty or surprise to such a probability scheme  $X$ .

Shannon and Wiener suggested the measure  $I(X) = -\sum p_i \log p_i$ . (The base of the logarithm is arbitrary: base 2 was suggested for communications systems. We use

the natural logarithm, or  $\ln$ .) This measure of uncertainty is also called the *average amount of information*.

We can also define conditional mutual information in terms of conditional probability densities:

$$I[z : x|b] = \ln [p(x|z,b) / p(x|b)] .$$

An interpretation for financial modelling situations is that  $z$  represents (raw) experienced or measured financial market data, and  $x$  represents the underlying reference value of the market variable. This could be a daily settlement price for a contract as quoted in a newspaper after the end of daily trading. The variable  $b$  can represent previously known values for  $x$ . The variables are all time-dependent.

$I[z_i : x_i|x_{i-1}]$  can then be written in terms of  $p(z_i|x_i)$  and  $p(x_i|x_{i-1})$ . The first represents market uncertainty and the second price uncertainty (volatility).

In brief, my talk showed how these ideas can be used to generalise volatility swaps so that market uncertainty as well as price uncertainty are incorporated into this financial instrument.

### Secondly, have you had a chance to put your theories into practice, and if so, were there any unforeseen challenges that arose in doing so?

No, I haven't tried to put my theories into practice. I enjoy dreaming up or trying to solve theoretical problems and hope others will then take it further. I have collaborated with practitioners in the financial industry, but generally prefer the theoretical side of things. I guess this is why I am a mathematician. But I admire people who tackle very practical problems, such as you guys in OR seem to do.

### Finally, do you have any advice for young Operations Research graduates looking to pursue a career in Operations Research?

Join our department at Unisa!

- Get a broad, practical introduction to descriptive, predictive and prescriptive analytics
- Learn from the best of high-impact operations research applications
- Refresh your analytical skills and update your professional toolkit.
- Meet experts and colleagues to share topics on applying analytics to solve real-world problems.

More details are available at [meetings.informs.org/analytics2014](http://meetings.informs.org/analytics2014)

## KEEPING UP WITH THE QUANTS — YOUR GUIDE TO UNDERSTANDING + USING ANALYTICS

By Hans Ittman ([hittmann01@gmail.com](mailto:hittmann01@gmail.com))

**M**erriam-Webster defines “quant” as “an expert at analyzing and managing quantitative data.” Although as Operations Researchers, we can exclaim, “that’s us!”, this book is not just for us quants.

A lot has been written recently about the rise of “big data” and how it should be used and analysed to assist and improve managerial judgement and decision making. While there are many people qualified to manage and analyse big data, the lack of know-how in understanding and using data optimally brings an increasing need for those who make decisions to have an understanding and insight into analytical thinking. This is the objective of the book, stated eloquently in the introductory paragraph, as follows: “We live in a world awash with data. Data is proliferating at an astonishing rate – we have more and more data all the time, and much of it was collected in order to improve decisions about some aspect of business, government or society. If we can’t turn that data into better decision making through quantitative analysis, we are both wasting data and possibly creating suboptimal performance. Therefore, our goal in this book is to show how quantitative analysis works – even if you don’t have a quantitative background – and how you can use it to make better decisions.”

This rise of big data implies that organisations are going to require analysts to do detailed analyses, but organisations also need people to make decisions and take actions based on these results. The latter, non-analysts and non-quantitative people are the intended readers of this book, which aims to make them better customers of data.

Credited with “creating,” but maybe more importantly generalising the use of the term *analytics*, Thomas H Davenport is a very credible author of a book on a guide to understanding and using analytics. **Keeping up with the Quants** follows two other books he co-authored, namely **Competing on Analytics** and **Analytics at Work**.

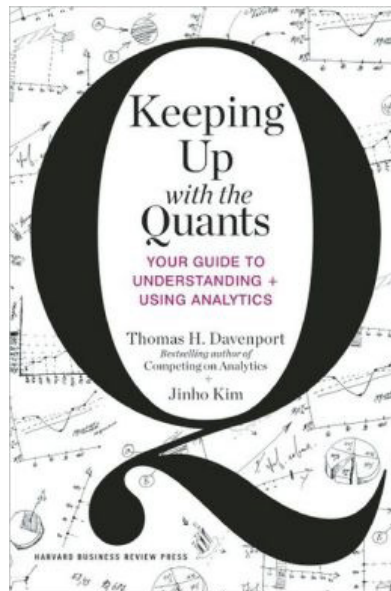
In this book, Davenport and Kim define clearly what they mean by “Analytics” and “Big Data” while tracing the rise

of the latter to the exponential increase in computing power and widespread availability of internet and social media. They deal, to a great extent, with the increasing necessity of analytical thinking and the consequent importance of the “informed consumer of Analytics”. Analytically-minded executives who ask the right questions without necessarily becoming expert quants themselves are highlighted throughout the book through a lot of illustrative examples. The authors present as a framework the three major stages of analytical thinking and the quantitative components within each stage, as follows:

Chapters 2 to 4 are devoted to each of these stages and steps within the stage. Even if slightly different methodologies and terms are used, most Operations Researchers would recognise and feel comfortable with these stages and steps. Framing, or defining the problem consists of a two-step process of problem recognition and reviewing previous findings. Advice is provided on conducting these steps while emphasizing their iterative nature. Many examples, even in the chapter on framing the problem, are explained through following the entire process fairly diligently. Focus on the decision maker or manager is consistently kept in the discussion on the analytical process.

The authors show that the second stage, frequently considered to be the core of analytics, is more structured and better defined. This stage, where quants are called in to assist, is covered in detail. Such aspects as: three ways to assign measures to variables; data collection phase with both primary and secondary data; and key statistical concepts and techniques are described. The latter is fairly comprehensive, but in the end some of this may be beyond the comprehension of the average decision maker. In many instances, there needs to be a greater differentiation between what is relevant to the quant and to the customer/user of the model.

The final stage, possibly the most crucial stage in any analytic study, is communicating the results and action required. A presentation of the different types of visual analytics and their purposes makes the reader aware of the different ways of presenting results, without losing focus



on the importance of communication in any modelling exercise.

An entire chapter is devoted to an area that undoubtedly needs much more emphasis in the operations research world, namely, creativity in quantitative analysis. It is stressed that “the most successful uses of analytics are highly creative, and creativity is an important component of successful analytical approaches to problems”. The four stages of creative analytical thinking are labeled: preparation, immersion, incubation and insight. Chapter 6 outlines how the analytical capabilities required by decision makers can be cultivated or learned. This is presented fairly comprehensively and in an easy-to-understand manner.

The final chapter is devoted to the topic of working with quants. Various relationships that should be in place are clearly spelled out, in particular, what the quantitative analysts should expect of business decision makers and vice versa.

In emphasizing the importance of improving analytical thinking for business people, the book encourages them to learn something about mathematics and statistics, as well as to understand and question assumptions. The quants on the other hand, are enjoined to: learn the business; be interested in the business problem; explain technical language; be willing to develop a relationship; and never make the decision maker feel stupid. A fascinating illustrative example describes the development of a forecasting model for CISCO. A high quality model was required, the success of which depended on the buy-in of management. To ensure implementation, the project team explained statistical techniques in a way that ensured confidence in the model.

Although *Keeping up with the Quants* is aimed mainly at exposing decision makers to analytical thinking, the book

has much to share with quants. Davenport and Kim have successfully opened the doors to the magical world of mathematics and quantitative analysis for decision makers through this book. However, as quants, we operations researchers, can benefit as much, if not more, from this book!

(This book review was originally published in the June 2013 IFORS newsletter and is published here with the kind permission of IFORS.)

*Book info: Keeping Up with the Quants – Your Guide to Understanding + Using Analytics* by Thomas H Davenport and Jinho Kim, 2013. Harvard Business Review Press, Boston, Massachusetts, USA. pp 240, ISBN-10: 142218725X (hardcopy), \$18.69; ISBN-13: 978-1-4221-8725-8 (e-book), \$14.99.

### DISCLAIMER

The views expressed in this Newsletter are those of the contributors and not necessarily of The Operations Research Society of South Africa. The Society takes no responsibility for the accuracy of the details concerning conferences, advertisements, *etc.*, appearing in this Newsletter. Members should verify these aspects themselves if they wish to respond to them.

### SOCIAL MEDIA

- **Facebook** — Please visit (and like!) our page at [www.facebook.com/ORSAfrica](http://www.facebook.com/ORSAfrica).
- **Twitter** — @\_ORSSA\_.

## 20th CONFERENCE OF THE INTERNATIONAL FEDERATION OF OPERATIONAL RESEARCH SOCIETIES



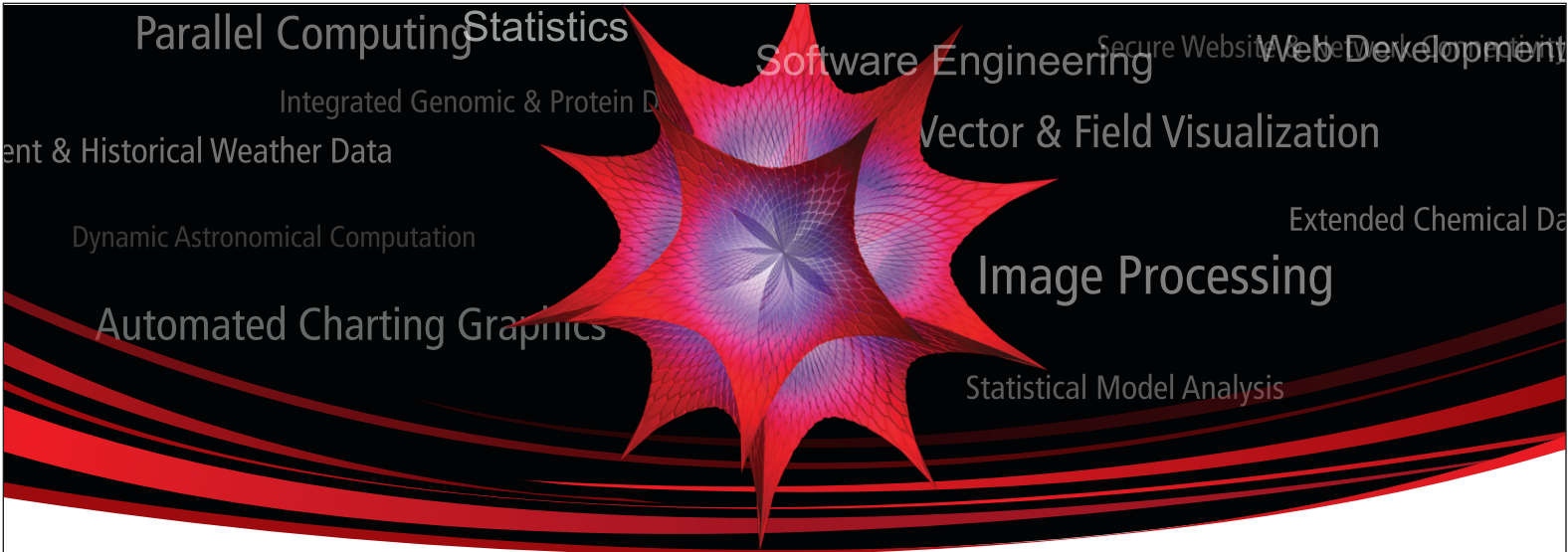
I F O R S

The Art of Modeling **BARCELONA 2014**

This triennial conference will be held from 13-18 July 2014 in the city of Barcelona, on the Mediterranean coast of Spain. We are working to prepare an attractive scientific program with a diverse and high quality number of participants sharing their knowledge and experience of operational research.

The venue is Barcelona International Convention Centre, which was built for Barcelona's International Cultural Forum in 2002 and is one of the facilities to host major conferences. Barcelona is a dynamic, open, and inviting city, which displays the characteristics of major Mediterranean cities and inherits a rich tradition in science, art and commerce.

We invite you to learn, enjoy, and be part of the great IFORS community by participating in IFORS 2014. Organize a session, give a talk and experience this great city! More details are available at [www.ifors2014.org](http://www.ifors2014.org).



# Wolfram *Mathematica*<sup>®</sup> 9

400 new features • 9 new application areas • 1 highly integrated system

If you are doing anything technical, think *Mathematica*—not just for computation, but for modelling, simulation, visualisation, development, documentation, and deployment.

Why *Mathematica*? Because this one integrated system delivers unprecedented workflow, coherence, reliability, and innovation. Rather than different toolkits for different jobs, *Mathematica* has been built over 20 years to deliver one vision: the ultimate technical application and environment.

➤ Find out more at [wolfram.com/mathematica](http://wolfram.com/mathematica)



Distributed by:

Blue Stallion Technologies  
Tel: (011) 447 9916  
Fax: (011) 447 9911  
[info@bluestallion.co.za](mailto:info@bluestallion.co.za)



# AnyLogic<sup>®</sup>

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

**The only simulation software supporting ALL modeling methods:  
Discrete Event, System Dynamics, and Agent Based**

-  **Social Dynamics**
-  **Business Process**
-  **Pedestrian Dynamics**
-  **Asset Management**
-  **Healthcare**
-  **Manufacturing**
-  **Supply Chain & Logistics**
-  **Transportation**



Distributed by:

Blue Stallion Technologies  
Tel: (011) 447 9916  
Fax: (011) 447 9911  
[info@bluestallion.co.za](mailto:info@bluestallion.co.za)

## MULTI-METHOD SIMULATION SOFTWARE



# How can you get the leading optimization software for free? It's Academic!

**Since 2002, FICO's Academic Partner Program (APP) has provided FICO® Xpress Optimization Suite free to academic institutions and their students.**

**In fact, you can even use Xpress for research and consulting.**

Sign up for the FICO Academic Partner Program today. It's free! Joining is the easiest decision you'll make all year.

***Learn more at [www.fico.com/app](http://www.fico.com/app)***

**FICO**<sup>™</sup>

**Make every decision count.™**