



*AT THE FOREFRONT OF ANALYTICS IN AFRICA*

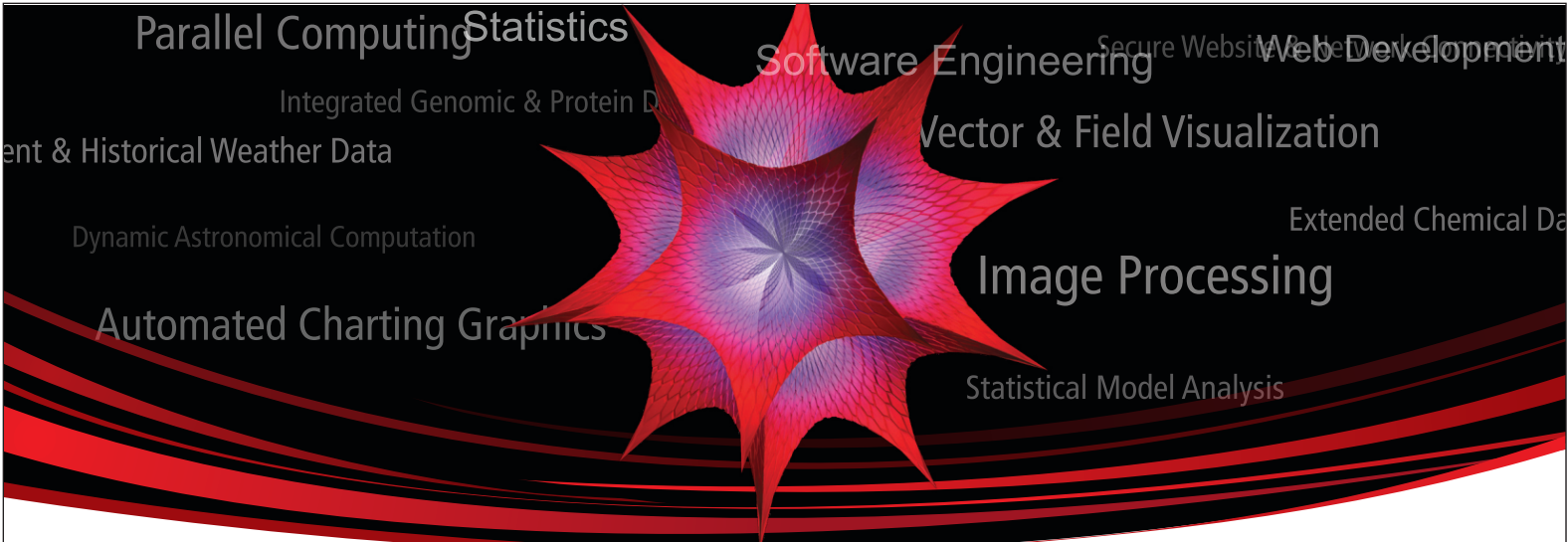


**INSIDE: A CASE STUDY IN THE  
DESIGN OF CALL SCHEDULES**

**ORSSA Newsletter June 2013**

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**FROM THE EDITOR**

By MARK EINHORN (einhorn@sun.ac.za)  
ORSSA NEWSLETTER EDITOR



Mark Einhorn

Hello members of ORSSA and to all a warm welcome to the second edition of the ORSSA Newsletter for 2013. I hope that at this mid-point in our calendar, you are able to look back on the past 5 months fondly, as well as being able to look forward to the coming months in anticipation. This is certainly the case here at ORSSA with numerous tasks afoot in an attempt to move the Society forward. June marks the first 2013 issue of ORiON being released which I am sure will be as interesting as ever. With that let me divulge what is contained in this issue of the newsletter.

We start with a word from our President in his column *From the President's Desk*. This is followed by a word from ORSSA's Marketing Manager, Dave Evans on how the Society's Executive Committee intends to market ORSSA. I can tell you that there are some very exciting prospects ahead for ORSSA should some of the Exec's ideas with regards to marketing ORSSA come to fruition. The feature article is written by Colin Philips of OPSI Systems and provides an excellent example of the application of OR techniques in industry. In his article, Colin discusses a particular project of OPSI in which a memetic algorithm is used to optimise rep call schedules for one of their clients. A very interesting read indeed. The member interview this month is with Aderemi Adewumi who is the current chair of the KwaZulu-Natal chapter of ORSSA. In this interview Aderemi discusses his visions for the Chapter. The Newsletter ends with yet another fascinating review by Hans Ittmann on a book about supply chain network design.

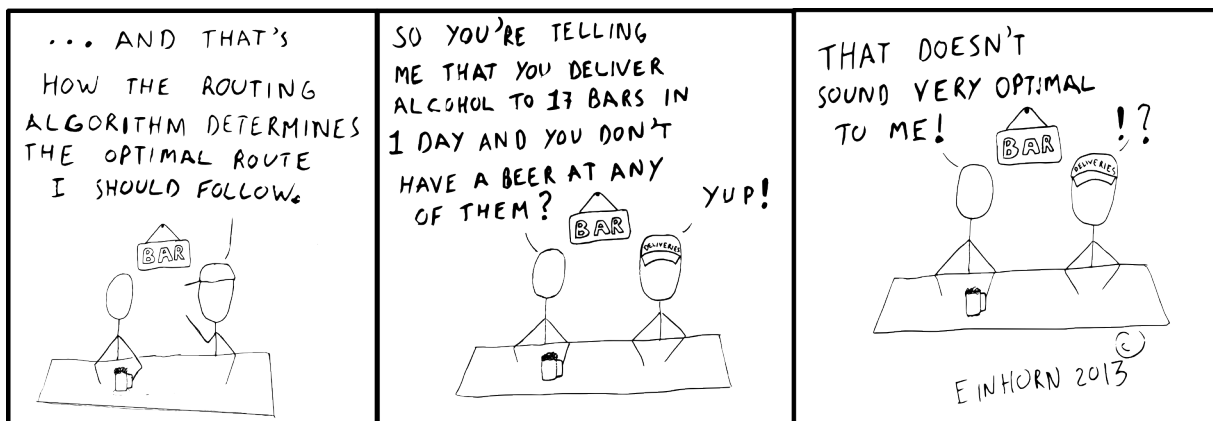
Before I sign off I would like to urge all of you to register for this year's National Conference. As ever, it promises to be relevant, interesting and above all enjoyable. That's all from me for now. Until September, cheers all, and enjoy the read!

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**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.



## FROM THE PRESEIDENT'S DESK

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

ORSSA PRESIDENT



Jan van Vuuren

As you read this, we are preparing at breathtaking pace to enter the second half of 2013! This is the last edition of the newsletter before we meet at our 42nd Annual Conference (during the period 15–18 September 2013 in Stellenbosch). Preparations for the conference are spearheaded by the Local Organising Committee Chair Danie Lötter (who is also our Newsletter Business Manager).

Theo Stewart (emeritus professor in the Department of Statistical Sciences at the University of Cape Town) will be our keynote speaker at this year's conference. He will open the conference with a plenary lecture on Multicriteria Decision Analysis – An Integrating Framework for OR and again close the conference with a plenary presentation on Multicriteria Decision Aid to OR for Development. These presentations promise to be an education in themselves.

In addition, there will be a number of other interesting conference sessions, including a panel discussion on forecasting of electricity demand in South Africa (led by Danie Payne of Eskom) and a special student competition session during which the two finalists of the honours and masters competitions will compete before a panel of judges for the first editions of the newly instituted Gerhard Geldenhuis Medal for the Best Honours/Fourth-year Project and the Theodor Stewart Medal for the Best Masters Thesis. We

have received three entries in the honours category and seven entries in the masters category of the National Student Competition – from all over the country and all of very high quality, to the extent that I certainly don't envy the judges!

Although abstract submission in the peer-review stream of this year's conference has closed, abstracts for the normal presentation stream are still open until 12 July 2013. Members are encouraged to register for the conference soon – early bird registration closes on 5 July 2013. The conference venue (the Protea Hotel Technopark, Stellenbosch) is already fully booked for the duration of the conference, but a list of eleven lovely guest houses and boutique hotels (all within easy reach of the conference venue) appear as accommodation alternatives on the ORSSA website (click on ORSSA 2013 and then on Travel & Accommodation). Members are encouraged to make their travel and accommodation arrangements soon to avoid disappointment.

Other news from the Executive Committee includes a brand new and exciting OR and ORSSA Marketing Strategy that is currently being drafted under the capable direction of our new Marketing Manager, Dave Evans. Dave will also be chairing a special panel discussion session at this year's conference during which the members' input into our Marketing Strategy will be sought.

As always I invite the members of our Society to contact me should you have any suggestions as to how ORSSA may improve the service that it delivers to its members or if you would like to become involved in any of the activities or initiatives of the Society.

Best wishes, until we meet in Stellenbosch in September!

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## MARKETING OPERATIONS RESEARCH AND ORSSA

By Dave Evans — Marketing Manager of ORSSA ([davevans@gmail.com](mailto:davevans@gmail.com))



Dave Evans

People who are attracted to OR are typically not the kind of people you find in sales, marketing or advertising agencies (and vice versa, I suppose.) Notwithstanding this, doing a better job of marketing OR and the Society in southern Africa is a topic which has come up on many occasions since the Society was founded more than forty years ago. In the days before tele- and video-conferencing, we even flew the inland members of the National Executive Committee down to the Cape for a workshop on the subject in 2004. As those of you who were at last year's conference will know, we have been revisiting the idea in the National Executive Committee (Exco) to the extent that as I stood down as out-going vice-president, a position of Marketing Portfolio was created, and I was voted into it.

We have been exchanging ideas on email in Exco and held a telecon between the available members on 22 April, and there was complete agreement about the potential for OR to address many big issues around development and 'corporate' effectiveness in both South Africa and the wider region. ORSSA has a big role to play in this. As you probably know, we have been active with an 'Africa Initiative' for several years, including taking our National Conference very successfully to Zimbabwe in 2011, with the help of the National University of Science and Technology in Bulawayo, and the University of Limpopo. The key issue is getting the OR message more visible; one of the ideas at the Conference last September was to utilise the current 'fad' around Analytics – a game that OR has been in for decades, long before that label became popular.

Our still-developing vision includes addressing both the public and private sectors, via OR consulting companies, universities and ORSSA and the Chapters, and probably an expanded approach to the education sphere, including schools. We also want to practice more effective 'CRM' (customer relationship management) with you, our current members, to keep you better up to date and engaged.

We therefore need a more active and effective approach to marketing. I recently circulated the summary of the tele-conference to the Exco members for more input, and hope to have a strategy and next steps by the end of May. Once we have agreed that, we will be distributing it to you all and inviting the wider membership to contribute both ideas and effort on how to take it forward. We recognise that we all have day jobs, and with the way the world seems to spin faster each year, increasingly less spare time. ORSSA doesn't have the resources of an IFORS or EURO, so we therefore need to find a realistic way forward, utilising all the pluses of the new social media channels, etc., for example, and making full use of all the components of the Society.

If you would like to know more about what's going on or get involved in the meantime, please contact me on [davevans@gmail.com](mailto:davevans@gmail.com). Note that I left the DBSA at the end of March, so if you have an old email address for me at the DBSA, that one no longer works.

I'm looking forward to hearing from you, and for ORSSA taking this forward in a way which increases our impact and makes a difference in the region.

### 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).



## A CASE STUDY IN THE DESIGN OF CALL SCHEDULES

By Colin Phillips of OPSI Systems ([colin.phillips@opsi.co.za](mailto:colin.phillips@opsi.co.za))

Sales reps are expensive. They get paid for the days that they are busy, the hours they put in, and the kilometres they drive getting to your customers. When you have a large mix of different products to sell, and lots of different types of customers, you need to make sure that you get the right person for the job. It's equally important to make sure that you don't waste this person's time.

OPSI Systems' client is a major distributor of a wide range of alcoholic products, servicing outlets of all descriptions. They put great stock into building a strong business relationship with each of these clients, and this means that the sales reps need to visit these clients in person, and spend quality time with them, performing all sorts of tasks, such as ensuring that each outlet is getting the right product mix – when the outlet gets maximum sales, so does the distributor and hence it pays to work together.

there is a natural tendency for reps to focus their attentions on bigger outlets which promise greater sales volumes per visit. This is great in the short run, but unfortunately it means that many of the smaller outlets with the potential to grow are neglected, especially in the rural areas.

The solution was to expand the sales rep teams – the new hires would be dedicated to visiting the outlets in the lower tiers of expected volumes. The outlets would be further partitioned into different types, allowing the sales reps to specialise in serving a particular kind of outlet.

OPSI Systems' task was to create a new set of call schedules for the entire set of reps. Over the 14 regions considered there were more than 11 000 outlets. Each outlet had to be assigned to the right type of rep. Each outlet also had to be assigned a "Visit Profile" – the pattern of days describing when the outlet would be visited. Based on this, the

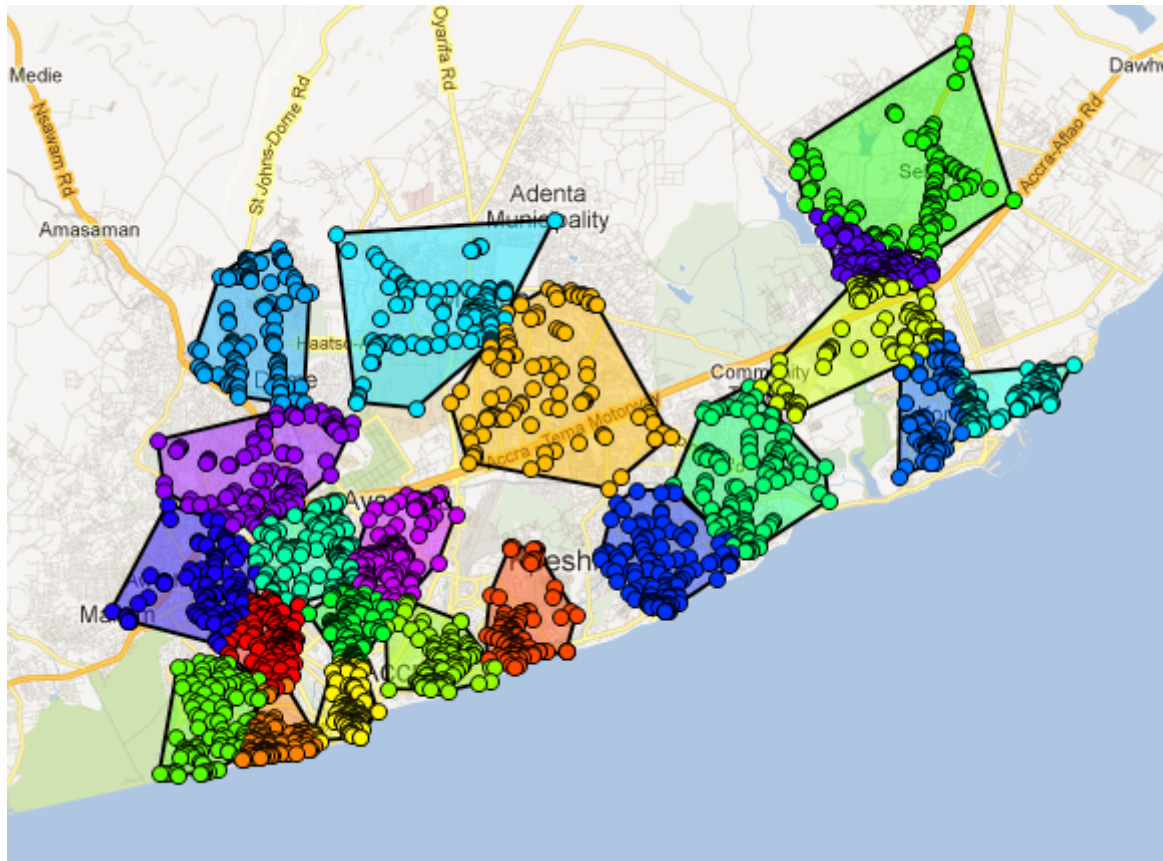


Figure 1: Client customer distribution and defined rep territories.

The client identified a few strategic goals, intended primarily to solidify its position as the premier supplier, namely: to grow the outlet base; to help smaller outlets to develop; and to strengthen the relationships with the outlets. To achieve this, the client decided to restructure the sales side of the business so as to drastically increase interactions with the outlets. The real problem was that

reps required driving routes for each day. Also, since the new hires were yet to be hired, the client wanted to know where the best place for these reps to live would be, so that they could concentrate their hiring efforts in those areas. OPSI Systems needed to find optimised call schedules that minimised total cost and distance travelled, while balancing the workload and distance travelled between the reps.

The reason why this is a difficult problem lies with the Visit Profiles – there are rules, different for each outlet, about which Visit Profiles are allowed. For example, an outlet may not be willing to see reps on a Friday, and may require, according to the business rules, a visit every week. This doesn't mean it would be okay to send a rep to that outlet on a Monday this week, and a Thursday next week – frequently the outlets would want to know that their rep is coming on the same day each week, so that they can plan ahead.

ORBIT (An acronym for *Optimal Route Building and Information Tool*) is a new product which solves this exact problem (known as the *Nominated Visit Day Assignment Problem*). By making use of a memetic algorithm, the solv-

er is able to optimise according to particular parameters.

A memetic algorithm works analogously to evolution, by starting with a population of potential solutions, and creating new, and hopefully improved, solutions by recombining different features of the best solutions found so far. However, the evolution is helped along with problem-specific heuristics which help the individual potential solutions to improve themselves.

Using ORBIT's memetic algorithm solver, OPSI Systems was able to find an optimised solution that minimised the number of new hires that were required, cut the regions into sensible territories, and balanced the workload

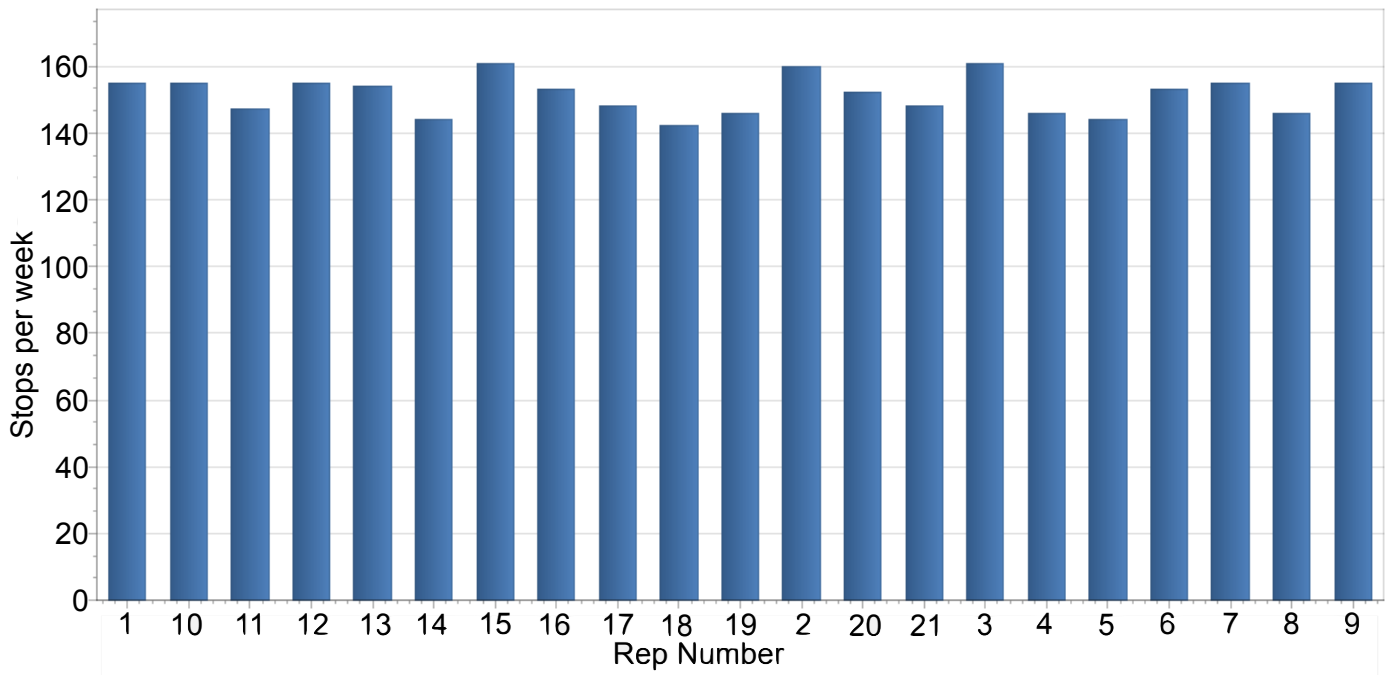


Figure 2: Total number of stops made by each of the 21 reps in a week.

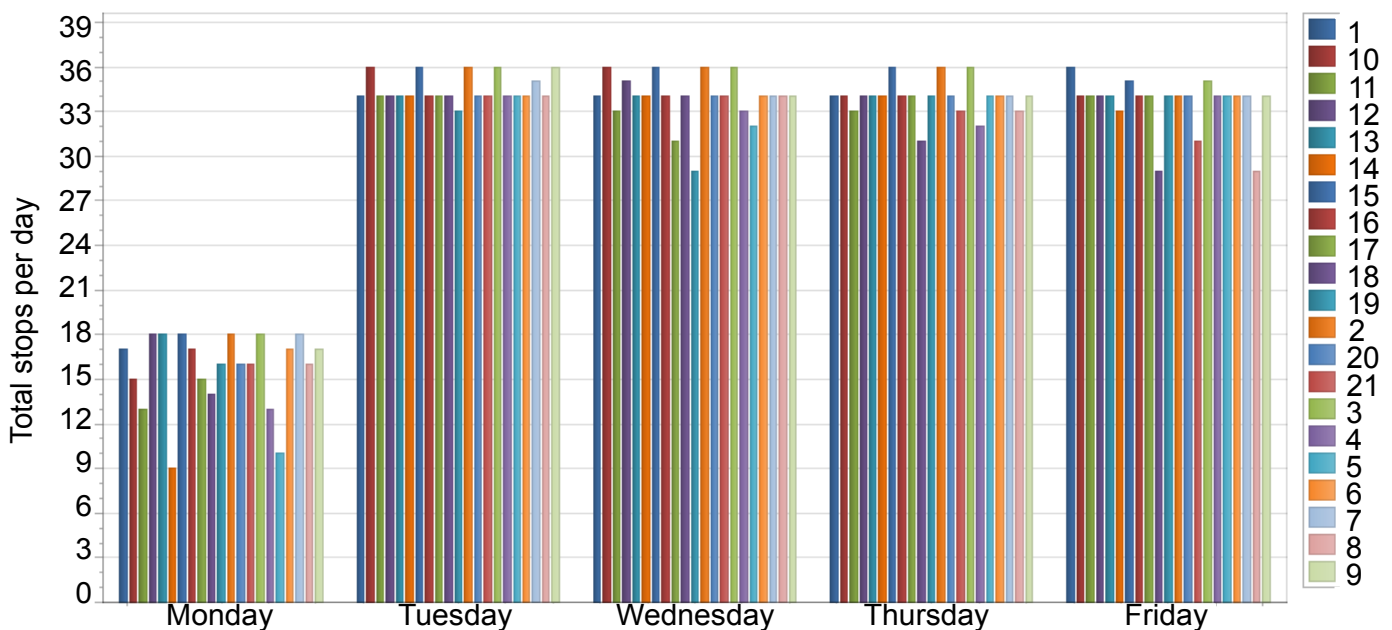


Figure 3: Total number of stops made by each of the 21 reps on each of the days of the week.

between all the reps. The solution thus found required no overtime, and minimised the time and kilometres that reps had to put in to be able to visit all their assigned outlets. Perhaps the most immediate benefit was that each rep's call schedule was clear and immediately available, along with statistics about the reps' workload, so that sales managers could truly understand the workload demands they made on their reps for the first time.

The total project time taken to redesign the visit schedules for all 11 000 outlets was a single week. This demonstrates the power of using the appropriate tool for a complex task.

## MEMBER INTERVIEW:

### ADEREMI ADEWUMI



Aderemi Adewumi

Aderemi Adewumi has been a member of ORSSA since 2009. He graduated and received B.Sc. and M.Sc. degrees in Computer Science from the University of Lagos, Nigeria. He received his PhD in Computational & Applied Mathematics from the University of the Witwatersrand, South Africa with specialty in Optimization and Computational

Intelligence. He currently leads the Optimization and Modelling research Group in the School of Mathematics, Statistics & Computer Science, University of KwaZulu-Natal, South Africa where he also offers courses in Computer Science and Optimization. He is also a member of Council of the University of KwaZulu-Natal. Dr. Adewumi serves as Editor, Reviewer and Editorial Board member for many reputable journals and international conferences. He is a member of several academic and professional organizations, including ORSSA, IEEE and IAENG. He currently serves as the Chairperson of the KwaZulu-Natal Chapter of ORSSA. He is well-published in accredited journals and conference proceedings, both in South Africa and abroad. His research interests include optimization and artificial intelligence, with particular interest in computational intelligence and (meta) heuristics solutions to real-world global optimization problems.

**T**hank you for agreeing to this member interview, Aderemi. Let me start by congratulating you on being elected as Chapter Chair of the KwaZulu-Natal (KZN) Chapter of ORSSA last year. How are things going with the Chapter so far?

So far so good. We are just settling down to restructure things in the chapter. The first step was to recruit new members as attempts to reach out and get old members

in the chapter did not yield any positive results. Most of them are either out of KZN or retired to faraway locations. The first drive was to persuade my students to join ORSSA and then reach out to outsiders. This is yielding some results, at least with the second Chapter meeting, held so far.

**What are your visions for the Chapter and what would you like to achieve as Chapter Chair in 2013 and moving forward?**

First I would want to see a revived chapter with strong membership. I would want to see people in the industry and academia alike getting to appreciate and embrace OR. I would want to see a strong collaboration eventually coming up between academic and industry regarding OR, especially in teaming up to provide solutions to a vast majority of obvious real-world OR problems in this part of the world.

**How did you come to be involved with Operations Research and, more specifically, ORSSA?**

I studied OR in my third year in the university and loved it so much. Though a Computer Science major, I did a lot of Mathematics too. I came to appreciate OR more when I started research in the area of optimization. Eventually, coming to South Africa gave me more opportunity to appreciate practical OR problems. It was actually my PhD supervisor who first introduced me to ORSSA (by way of invitation to attend his special talk to the Johannesburg Chapter). Earlier, I attended the IF-ORS 2008 Conference in Sandton where my paper was shortlisted among the eight finalist papers for the "OR in Developing countries" competition. That gave the push.

**You are currently employed at the University of KwaZulu-Natal. What is your role at the University?**

I was employed primarily for teaching and research in Computer Science. Aside other modules, I developed our current Honours module on Optimization and Modelling, which I offer every year. I make the module very interesting through a good blend of theory and practical problems. My students are taught to develop optimization models to real-world problems and to develop methods (with some emphasis on Computational Intelligence Solutions) to solve those problems.

**Can you enlighten us on your research interests and projects you are currently busy with?**

My primary research interest is in the area of Optimization, especially developing heuristic solutions to real-world optimization problems. I try to seek innovative, efficient and competitive heuristics (and variants) to solve practical problems. This includes the use evolutionary algorithms, swarm intelligence, machine learning etc.



The research is in a way multi-disciplinary in nature as I employ ideas from various disciplines to design innovative heuristics and/or solve practical problems that exist in different disciplines and human endeavours. Presently I consider problems from medical science, education institutions, financial industry, telecommunication, software industry and sports, to mention just few.

**What are some of your fonder memories as an ORSSA member?**

Last year when I was suddenly called during the ORSSA award night to receive the award on behalf of my student for the best student project in the Honours' category. I remember the interactions and trips we made to Zimbabwe in 2011 also. Sailing on the river was such fun.

**Finally, do you have any words of advice for young**

**Operations Research graduates looking to pursue a career in Operations Research?**

First I want to say that a decision to pursue a career in OR is one of the best any young graduate can take. I foresee a gradually emerging future that is moving towards what is obtained in the developed countries like Europe, the United Kingdom and Canada. Take, for example, job offers in the software industry. The majority of companies are not only looking for a mere certificate (as a graduate) anymore; there is high demand for specific knowledge relating to OR techniques which is needed to develop intelligent and tailored decision support systems/tools. I think about 70% of IT jobs in some of these places now require that the applicant have knowledge of evolutionary algorithms. The trend is gradually coming to countries like South Africa and when it does, OR graduates should be prepared to take the lead. Keep the passion for OR burning. You will soon reap the fruit of such a passionate pursuit.



**42<sup>nd</sup> ORSSA Annual Conference  
15–18 September 2013**

An advance warm welcome to the 42nd Annual Conference of the Operations Research Society of South Africa (ORSSA)! The Conference will be hosted by the Western Cape Chapter of ORSSA, and will be held at the Protea Hotel Stellenbosch in Technopark, just outside of Stellenbosch, from September 15th to 18th, 2013.

The conference will open with a welcome reception on Sunday evening September 15th and will close at lunch-time on Wednesday September 18th. 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.

**Important Dates**

<b>17 June</b>	Submission of full papers for inclusion in the conference proceedings closes
<b>5 July</b>	Early bird registration closes
<b>12 July</b>	Abstract submission closes for oral presentation of all papers
<b>22 July</b>	Notification of abstract acceptance for non-reviewed papers
<b>29 July</b>	Notification of acceptance of reviewed papers for proceedings
<b>26 August</b>	Registration closes

Delegates are responsible for their own travel and accommodation arrangements. Recommended guest lodges may be found by visiting the ORSSA website at the address below.

Conference delegates have the option either to present non-peer reviewed papers at the conference (as we have become accustomed to in the past, and for which only an abstract submission is required), or to submit full papers for peer-review with the intention of having their papers published in conference proceedings, if accepted for publication.

Please visit the conference website for more information:

<http://conferences.sun.ac.za/index.php/orssa/>



# SUPPLY CHAIN NETWORK DESIGN — APPLYING OPTIMIZATION AND ANALYTICS TO THE GLOBAL SUPPLY CHAIN

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

More than a decade ago a prominent logistics expert made a profound statement about the importance of supply chains – he indicated that: “it is not products that compete any longer but supply chains.” Any company that wants to compete in the global market needs to ensure that their supply chains are efficient, effective and that they continuously seek to improve their supply chains. Strategic supply chain network design is critical in this endeavor, especially to remain competitive and sustainable. Any supply chain is defined by its suppliers, different plants, warehouses, and finally the flow of products from each product’s origin to the final customer. What number, and where to locate facilities is a critical factor in the success of any supply chain. Strategic supply chain network design is thus about selecting the correct number, location and size of warehouses as well as production facilities. A number of very experienced professionals in this field joined together to write the book, *Supply Chain Network Design* which is in essence about applying quantitative analysis in order to optimize a firm’s supply chain.

Any network design project should be able to answer a whole range of different questions and, to quote directly from Chapter 1 of this book, these include:

- How many warehouses should we have, where should they be, how large should they be, what products will they distribute and how will we serve our different types of customers?
- How many plants or manufacturing sites should we have, where should they be, how large should they be, how many production lines should we have and what products should they make, and which warehouses should they service?
- Which products should we make internally and which should we source from outside firms?
- If we source from outside firms, which suppliers should we use?
- What is the trade-off between the number of facilities and overall costs?
- What is the trade-off between the number of facilities and the service level? How much does it cost to improve the service level?

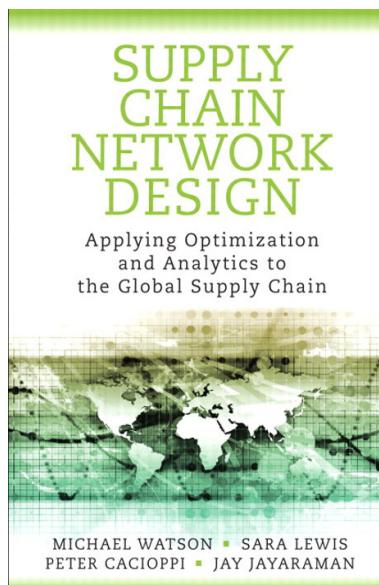
- What is the impact of changes in demand, labour cost, and commodity pricing on the network?
- When should we make products to best manage and plan for seasonality in the business?
- How do we ensure the proper capacity and flexibility within the network? To meet demand growth, do we need to expand our existing plants or build new plants? When do we need to add this capacity?
- How can we reduce the overall supply chain costs?

These questions summarize what is covered in detail in *Supply Chain Network Design* and the reader is taken step by step through the underlining theoretical principles of

what is required for network design. This is then illustrated, throughout, by countless very practical and relevant applications. The vast experience of the authors, gained over many years, and with many different applications is clearly visible. Not only do they present better ways in deciding what to manufacture internally, at what locations to make these products, which of the different products to outsource, and which suppliers to use, they continuously share their experience in doing this, provide detailed insight and point out possible oversights or pitfalls. In addition the reader is guided on how to more effectively manage trade-offs such as costs against service levels, how to improve operational decision-making

by utilizing analytics, and, importantly, re-optimizing regularly for even greater savings. The topic and subject area represents possibly one of the most fertile, and exciting, application areas for analytics and operations research!

The book is divided into five parts, each with a number of chapters. In the first part the basic building blocks of network design are presented. After giving an overview of the value of supply chain network design, the first building block covers intuition building with centre of gravity models. Next topics include locating facilities using a distance-based approach, how to deal with different service levels and explaining sensitivity analysis and its importance. Adding capacity to the models is the next building block. This is the pattern throughout; every new chapter and part considers a further aspect, or complication, that needs to be considered in the supply chain design pro-



cess. A detailed description of how to model these, plus the applicable mathematical model, is discussed in a very logical and understandable manner. Part two covers the issue of adding costs, such as that associated with outbound transportation and fixed and variable facility costs, to two-echelon supply chains. The justification for every enhancement, or extension to the models is explained fully.

The third part considers advanced modelling and expansion of multiple echelon supply chains (*i.e.* where the supply chain extends from a plant facility, to a warehouse and from there to the customer). In this part the art of three-echelon supply chain modelling is covered with the next two chapters focusing on adding multiple products and multiple production sources. Multi-objective optimization problem situations and how these should be addressed is the topic of the last chapter in part three. There is more to just formulating models for these types of problems. In the network design environment the art of modelling is critical; a whole chapter is devoted to this topic. Other issues dealt with are data aggregation in network design and how to establish a project team as well as how to project manage such a project. The last part, part 5, is dedicated to a case study where most of the concepts and aspects that are so important in supply chain network design are addressed.

The readability of the book is greatly enhanced by the manner in which topics are introduced and concepts defined. One of many examples is the chapter in which outbound transportation is introduced. Here the different modes of transport, and how the rates for these are typically provided, are introduced in a fair bit of detail. These different

modes are full truckloads, private or dedicated trucks, less than truckloads and parcels as well as ocean transport, rail transport, intermodal transport and the multi-stop mode. In concluding each chapter a brief summary is provided of what the chapter entails together with end-of-chapter questions. Finally, there is a supporting website that contains errata, links to other useful information, as well as downloads of the models, more details on the case studies, spreadsheets, as well as additional case studies not in the book.

Supply Chain Network Design is an excellent book that would be of value to all supply chain executives, managers, strategists and analysts as well as for all students and instructors in advanced supply chain management and/or logistics courses. Without any hesitation this reviewer will highly recommend this book to the OR practitioner!

*Book info: Supply Chain Network Design – Applying Optimization and Analytics to the Global Supply Chain by Michael Watson, Sara Lewis, Peter Cacioppi and Jay Jayaraman, 2013. FT Press, New Jersey, USA. pp 301, ISBN-10: 0-13-301737-0. \$72.99 and Kindle edition \$51.49.*

## 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.



**OCTOBER 6 — 9**  
**MINNEAPOLIS CONVENTION**  
**CENTER**  
**MINNEAPOLIS, MINNESOTA**

The INFORMS 2013 Annual Meeting will cover topics ranging from business analytics to workforce management. INFORMS Minneapolis offers a vibrant, progressive environment for people to come together, look forward, and share and discuss scientific advances.

INFORMS Minneapolis will take place in the Minneapolis Convention Center, located in downtown Minneapolis and connected via enclosed skyway to the two headquarter hotels, Hilton Minneapolis and Hyatt Regency. With over twenty lakes and wetlands, the Mississippi River, creeks and waterfalls, Minneapolis is abundantly rich in water and trees. The conference will be held in mid-October, known for its beautiful fall weather and moderate temperatures.



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