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ORSSA Newsletter December 2019

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FROM THE EDITOR

By *BRIAN VAN VUUREN*

(*brianjohnvanvuuren@gmail.com*)



Brian van Vuuren

In March 2015, I wrote a movie review for the quarterly edition of the newsletter, then under the editorship of Bernie Lindner. Little did I know it was the beginning of a 5 year journey, serving first as the co-editor to Bernie for the 2015/2016 year, and then taking over as editor for a further 3+ years, all culminating in this final newsletter edition

in which you'll have to see my face in this column.

It's been interesting, frustrating, enjoyable, satisfying and, I guess most prominently, a *labour of love*. As I advocated so passionately in my September editor's column, the ORSSA society is (*or, at least, should be*) the sum of many small efforts from its constituent members. This has been my small effort and, although it's been a *pain in the neck* at times, I will look back on the role (*as editor and Executive Committee member*) with fond memories.

I was first exposed to the ORSSA newsletter in early 2014, when Mark Einhorn was still its editor and, although in many ways things have stayed much the same, quite a bit has also changed since then.

We stopped issuing hard copies of the newsletter during my term, in favour of a more time efficient, cost-effective and less labour-intensive means of distribution via email. It's at this point that I must pause and thank any of the many postgraduate students from the SUnORE research group who so willingly assisted in packaging, sealing, stamping and posting the physical newsletters of times gone by. I think some of us are still nursing papercuts from those dreading packing days!

Something else that has fundamentally changed is my view of the newsletter. I used to see it as a by-product of the society – a *'nice to have'*, but nothing overly important. What I've since come to realise is that the newsletter is so much more than that! It's not the by-product of the society at all. Quite the opposite, infact – it's the *intentional* efforts of society members to keep the conversation about operations research alive and active within the ORSSA community. It's the *lifeblood* of the society and a way in which we all get to *'stay in touch'* with our fellow ORSSA family and friends. You may not be able to make a meet-up, or afford attending a conference, but anyone and everyone can take 10 minutes to peruse an email attachment and catch up on the research, profiles and updates from ORSSA locals.

So, two things from me as I hang up my keyboard:

Firstly, to each and every person who has contributed

something to the newsletter during my term as editor – I truly thank you. You've helped me keep the *heart* pumping the society's *lifeblood*. To those who so regularly went above and beyond to contribute – Hans Ittmann, Rob Bennetto, Dave Evans, my friends and colleagues of the SUnORE and *Surgor* research communities, and many others – thank you for prioritising my portfolio and committing your valuable time to helping me get a high quality newsletter edition out each and every quarter for the last 3+ years.

And, secondly, thank you to the executive committee for allowing me the opportunity and privilege to fulfill this role as editor. Among others – to Winnie and Danie as presidents, Lieschen as the most capable and committed secretary ever, and Bernie as the newsletter manager: I trust I've represented the brand of ORSSA well. To the readers – thank you to those who read through each edition and, most especially, to those who kindly send messages of appreciation and encouragement to me after the fact. It has inspired me to keep the role up and I'm so glad to have enriched your experience as an ORSSA member.

And, even as I feel quite emotional in letting go of *my baby*, it's by no means my last contribution to the newsletter (*or society*). Even if only in the comic strips, I'll continue to contribute where I can. I wish Annelie all the best with her term as editor – I trust her fresh perspective and diverse set of skills will steer the newsletter to greater heights. I am already excited to receive and read the March 2020 edition!

So, for the last time from me, then – thank you so much, and enjoy this quarter's edition!

With festive greetings,
Brian

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FROM THE PRESIDENT'S DESK

By DANIE LÖTTER

(DANIEL@GLOBELOTTER.COM)

ORSSA PRESIDENT



Danie Lötter

Greetings to all ORSSA members. As I am writing my last column from the President's desk, we are well into the second half of December and the 50th celebratory conference that we had at the Vineyard hotel in September is a mere memory. This year has again been a busy one and I believe the majority of

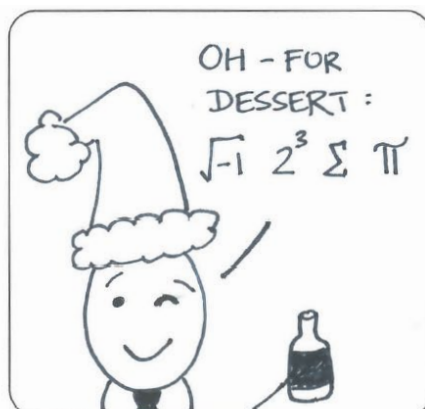
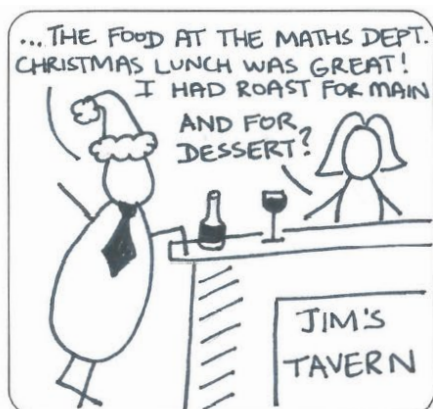
our members are now starting to wind down into holiday mode for some well-deserved off time. This edition of the Newsletter is the final edition for 2019 and also the final one for my term as President of the Society.

This year was once again a busy and successful year for ORSSA. The Society's active chapters were very proactive throughout the year and provided members with ample networking opportunities in the form of meetups, colloquiums from industry partners, workshops and social events. I believe the highlight for many members was the successful meeting we had in Claremont in the form of the society's annual conference, since the society's 50th birthday anniversary was celebrated at this event.

I was again amazed by the variety of papers presented at the conference. This serves as a confirmation of the wellbeing of OR in South Africa and I am very excited about the future of OR and ORSSA in South Africa.

I would like to heartily thank each member of the Society who made the effort to attend the conference this year. In addition, I would like to thank each member of the Society at large for their contributions and also extend a special word of thank you to the national Executive Committee in particular who have helped to make 2019 a successful year for ORSSA.

The dating mathematican strikes (out) again...



The members are at the core of the society, and the commitment to ORSSA amidst severe pressures of work schedules and personal life responsibilities over the last year from a large number of members has 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 would like to thank the 2019 Executive Committee for all their hard work and effort that they have put in ensuring that their portfolios are managed with high standards. To the new incoming president, Gemma Dawson, I would like to wish you all the best of luck in your new venture and look forward to serving with you on the Executive Committee in the capacity of vice-president.

Finally, allow me the opportunity to wish each and every member a safe, happy and peaceful festive season. I hope that you are able to enjoy quality time together with family and friends over the festive period, and I trust that you will be able to rest adequately before the onset of the 2020 work year with all its challenges and opportunities. May 2019 be a memorable year for Operations Research in South Africa!

HAVE YOUR SAY

The ORSSA Newsletter is an excellent medium for showcasing one's work or interests to the Operations Research community, not only in South Africa, but around the world.

Contributions of any nature are welcomed. If you would like to submit material to the Newsletter, please send your article or review, along with all associated media (e.g. images, charts, etc.) to the editor at anne-lie99@hotmail.com

GETTING TO KNOW THE 2020 NEWSLETTER EDITOR

Compiled by Brian van Vuuren (brianjohnvanvuuren@gmail.com)
& Annelie Wessels (annelie99@hotmail.com)



Annelie Wessels

As of next year, the ORSSA quarterly newsletter will have itself a new editor, Annelie Wessels. Of course, I wasn't just going to pass on my baby to anyone, so I sat down with Annelie to get to know her a bit better as she gears up to take on the most prestigious portfolio on the ORSSA exec:

I studied Quantitative Management undergrad and did my honours last year. You can read more about my honours research in my article in this newsletter.

What will you be doing in 2020 (other than lovingly compiling the newsletter, of course)?

I am currently busy with my masters in Quantitative Management. I will be compiling the newsletter from the Netherlands for the first semester next year as I am doing a semester exchange at Tilburg University.

How did you first become involved in ORSSA?

My supervisor, Dr. Linke Potgieter, and I had a deal. She entered my research project into the 4th year competition. I told her that I would only go to the conference if I made top two and have to present. I obviously did not think in my wildest dreams that I would make top two, that's why I was very confident in our deal. She won the deal and I had to attend this year's conference and therefore became a member.

What inspired you to take on the portfolio of newsletter manager?

Again, Dr. Linke Potgieter. She asked me if I was interested because she knew I had previous experience with newsletters and that I love writing (not that much, but more than the average OR-person). I thought I would have to consider it for a while, but I think I agreed to it in less than a hour after she asked me.

What has been your academic/professional journey in OR thus far?

For someone who is extremely organized and plans everything months ahead, it was a big surprise to all of us that I



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agreed. Especially since I am not in the country next year. But I do love a challenge, so I am looking forward to next year.

Do you have any exciting plans or ideas for the newsletter?

My plan is to keep it more or less like it is, but knowing myself I will probably get weird ideas along the way. We will have to see. It will be a surprise to all of us.

What are some ways that ORSSA members can contribute to the newsletter?

Anyone can contribute in any way they would like. I will try to put effort into science communication especially. So anyone who already has some research (in progress or results) can write a short informal article to publish in the newsletter. It is important for me to communicate our work with people who do not really understand what we are doing, or rather, do not know what we do or who we

are. I will therefore also try to distribute the newsletter to companies that I think would be interested in the society and the kind of things we do.

What are you most looking forward to about being newsletter editor?

As I said, I am a very organized person. Extremely admin oriented. Therefore, although it may sound stupid to other people, I am looking forward to the layout of the newsletter, making sure everything is correct. That all the lines are even, blocks aligned and spaces correct. Not that it wasn't fine previously, those small things just give me thrills, so I am especially looking forward to that.

Annelie's first newsletter as editor will be circulated in March 2020, so please get in touch with her if you have a piece that you would like featured in the newsletter!

WHAT O(U)R MEMBERS ARE UP TO

Compiled by Andries Heyns (aheyns@ua.edu)



Andries Heyns

Since September 2018, ORSSA member Andries Heyns is busy fulfilling a research post at the Laboratory for Location Science (<https://locationscience.ua.edu>) in the Department of Geography at the University of Alabama. The director of the department is facility location and GIS 'guru', Kevin Curtin (<https://locationscience.ua.edu/People/Curtin/Curtin.html>), who completed his PhD under the supervision of Richard Church. You may be familiar with Church as the man who, together with Charles Revelle, formulated the *Maximal Covering Location Problem* (http://www.geog.ucsb.edu/~forest/G294download/MAX_COVER_RLC_CSR.pdf).

Andries' current focus is on the optimisation of tower site locations for South African-developed ForestWatch camera-based wildfire detection systems. He recently published an article in the *International Journal of Wildland Fire* (<http://www.publish.csiro.au/WF/WF18196>), with a further article currently under review for publication in *Computers & GeoSciences*.

Further, his team has been selected for the second round of the *IFORS prize for OR in development 2020* and Andries is currently working on a manuscript which will serve as their final entry and a journal submission.

Other projects which Andries leading at UA include site optimisation of lookouts and surveillance equipment for a rhino sanctuary in Bela-Bela with the *Rhino Pride*

Foundation, as well as digitizing historical shark sighting tracks around False Bay with the aim of analysing current and possible future lookout locations (*preliminary results seem to support the reports of dwindling great white shark numbers in False Bay*).

Outside of UA (afters hours when he should be sleeping), Andries is working as a short-term consultant for the *World Bank's Poverty and Equity Global Practice* group,



A photo of Andries with fellow University of Alabama academic James Cochran – Associate Dean for Research, Department of Information Systems, Statistics, and Management Science, Culverhouse College of Business (<https://culverhouse.ua.edu/news/directory/james-cochran/>), who was a plenary speaker at ORSSA 2006 and 2007. This was Andries' first ORSSA conference, about which he comments "I had the pleasure of attending his talk. Yes, I'm that old."

The two shared an enjoyable lunch and Andries will be lending James his copy of the *OR in South Africa: The first 50 years*, in which he is mentioned.

implementing a new cost-time model for the construction of roads in rural Nepal. He is doing some work on the GIS aspect, but mostly optimisation of the selection of roads to construct, from a large number of potential roads, with the aim of maximising the improvement in accessibility to essential services within a given budget, considering both 'normal' and 'monsoon' seasons.

And, in other fun facts, Andries has trademarked his own wine label and registered the company, *Ma Se Oes*, aiming to launch around February 2020. Fifty percent of the proceeds from the wine will be divided between animal shelters (of which Andries plans to launch his own) and the *Rhino Pride Foundation*. He's even agreed to donate some to the ORSSA banquet next year!



Following this year's ORSSA conference, Andries had a very busy two weeks meeting with forestry experts in Sabie to continue their wildfire detection work, and has since attended a National Cohesive Wildland Fire Management Strategy workshop in Plymouth, Massachusetts (<https://www.iawfonline.org/event/2019-cohesive-strategy-workshop/>) together with the Forest-Watch team mentioned in the publication cited earlier in this article. Apart from the wildfire meetings, Andries also did a site visit to the future Rhino Sanctuary site in Bela-Bela for which he'll be doing detection and surveillance optimisation (Andries and a rhino are in a stare-off in the photo which he claims to have won...).

LET US KNOW WHAT YOU'RE UP TO

The ORSSA community would love to hear your news. If you've taken on a new job, an interesting research topic, completed your studies or finished a noteworthy certification or course, please let us know and it may be featured in one of our upcoming newsletters. Please send all relevant information and media to annielie99@hotmail.com.

THE YEAR BEYOND THE RESEARCH

Compiled by Annelie Wessels (annielie99@hotmail.com)



Annelie Wessels

Annelie Wessels was the runner-up in the 2019 ORSSA student competition at Honours/4th year level. During the 2019 conference, she presented during the special session dedicated to the competition finalists. We touched base with her to hear how the implementation of her research had progressed since its completion the previous year.

For my honours project I built a discrete event simulation model of the patient flow at a state clinic. The objective was to decrease the total time that patients spend in the clinic. To prepare for my presentation, I went back to the clinic where I did my research.

When I presented my results to the clinic last year, everyone was very optimistic to implement some of my suggestions. Especially after the 3D model that I showed them of the potential patient flow in the clinic, everyone was quite eager to tackle a few problems and implement a few suggestions.

The clinic promised to look at my suggestions at the begin-

ning of this year and although they sounded optimistic, I had my doubts. I know the clinic has a shortage of staff as well as resources which they have to share amongst them. This, together with the strain on financial resources, just were not an ideal combination and my hope for them was little. The operational manager of the clinic is also a practicing sister and therefore one cannot expect her to drive this whole project. It had to be a group effort.

When I heard that I had to present my research again, I decided to go back to the clinic and see what they have been up to during this past year. Since I kept in touch with the people there, it was quite familiar when I arrived back at the clinic and everyone welcomed me with open arms.

At first, I was quite sceptical, because when I arrived there was a power outage and chaos was running through the clinic's hallways. I still had little hope and thoughts of "why did I even try" crossed my mind. I greeted everyone and made small talk, but decided to go back on another day when circumstances were normal and I can calmly talk to the people there.

After I went back for the second time, I could not believe what they told me. There were actually one or two extra people appointed to help out, one for admin which I specifically pointed out in my research. I nearly fell off my chair

when I heard this, because that position had been vacant for a very long time. Secondly, they actually changed one leg of their appointment system according to my recommendations and got rid of the “first come, first serve” approach for the sister’s appointments.

I know, and they know as well, that there are still some major changes that need to follow to make the patient flow more efficient. I also know that it must have been extremely difficult for them to implement the changes they have already made. Not only is it a different way of doing

things for them, but to change that mind set amongst the patients can be very difficult. Although it is not perfect yet, and probably never will be, it’s encouraging to see how they continue to try and improve their operations.

I am extremely proud of this clinic. Despite of all the challenges they face, they still want to make a difference and be better in what they are doing. This experience gave me purpose and made me excited about my future career in this field.

ORSSA WESTERN CAPE CHAPTER EVENT

by *Christa de Kock (christadk@sun.ac.za)* & *Kit Searle (18268420@sun.ac.za)*



Christa de Kock

Dr Marie-Elizabeth Paté-Cornell is a professor and the founding chairperson of the Management Science and Engineering department at Stanford. Her focus is primarily risk analysis within the realm of complex systems.

Furthermore, she is a member of the National Academy of Engineering, the French Académie des Technologies, the Naval Post-Graduate School Advisory Board, and the NASA advisory council. As if that is not impressive enough, she was also a member of the US president’s Foreign Intelligence Advisory Board from 2001-2008.

Dr Paté-Cornell began her career by obtaining a Bachelor of Science in Mathematics and Physics, followed by an Engineering degree in Applied Maths, as well as a Master of Science in Operations Research and, finally, a PhD in Engineering-Economic Systems from Stanford University.

The joint University of Cape Town and ORSSA Western Cape chapter event was held on 13 March at the University of Cape Town. Dr Paté-Cornell presented a very interesting talk on formulating risk analysis problems within the context of space and medical cases.

The talk was divided into two parts, where the first part focussed on some of her work done for the Kennedy Space Centre, while the second part involved work completed within the medical sector. She presented the methods involved in quantifying the risk of a space shuttle failure as a result of defective aluminium heat shields which prevent the space shuttle from burning up upon re-entry into the atmosphere.

Through her analysis, she pointed out a major vulnerability with respect to the fuel line of the space shuttle. A few years after she made her recommendation in addressing this vulnerability, the Columbia space shuttle disintegrated upon entering the earth’s atmosphere as a result of a damaged heat

shield caused by debris from the fuel line which struck the shuttle during take-off.

When asked why the space agency failed to address the matter and employ her recommendation, she bluntly answered, “Perhaps if I was a man speaking with a German accent, rather than a woman with a French accent..”



Kit Searle

In the next part of her talk, Dr Paté-Cornell presented work on the dynamic formulation of the evolution of an accident sequence and the response of the risk management team, for anaesthesiology. At the start of the study, it was believed that the greatest contributor risk with regards to anaesthesiology accidents was drug or alcohol abuse.

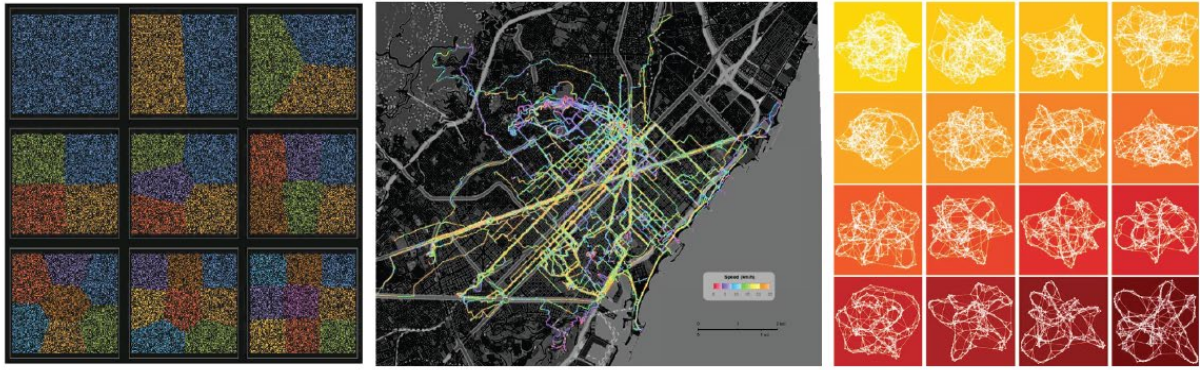
Dr Paté-Cornell then pointed out that in actual fact, the greatest contributor was the lack of retraining for experienced anaesthesiologists. She recommended that a retraining program is implemented by means of a simulated surgery where any potential obstacle can be triggered at any time. This will allow the anaesthesiologist to potentially avoid a fatal accident.

After Dr Paté-Cornell’s presentation, the attendees had the opportunity to engage with her, as well as the other delegates over a cup of coffee in one of UCT’s tea rooms. The ORSSA Western Cape Chapter would like to thank both Dr Paté-Cornell and UCT for this enlightening colloquium.

WHAT’S YOUR CHAPTER UP TO?

If your local chapter is hosting any interesting and enjoyable events, let the community hear about it! This not only encourages other chapters with ideas for their own events, but also helps rope in those who are ‘out of the loop’ with your chapter. Please send all relevant information and media to annielie99@hotmail.com

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STUDENT PROFILE: MARNO DU PLESSIS

Questions by Brian van Vuuren (brianjohnvanvuuren@gmail.com)



Marno du Plessis

One of the long-advertised benefits to students who form part of ORSSA as student members is the ability to use the newsletter as a means to market themselves to the working world upon completion of their studies. In my 3+ years as newsletter editor, this golden opportunity has been embraced a sum total of zero times! As such, it is with

great excitement that, in my last edition as newsletter editor, I get my first chance to profile a (top quality) student who is about to enter the working world and looking for opportunities in the industry. I sat down with Marno to find out where he comes from, and where he'd like to go:

What is your academic background?

I have completed my Master's degree in operations research at the Department of Industrial Engineering, Stellenbosch University towards the end of 2019. In December 2017, I have obtained my Bachelor's degree in industrial engineering *Cum Laude*, also from Stellenbosch University. I grew up in the northern suburbs of Cape Town and matriculated in 2013.

Why or how did you decide on Industrial Engineering?

Arguably the main element that drew me to industrial

engineering in the first place was the notion of optimisation. I found, and still do, the idea of making something faster, cheaper, better, stronger or whatever the case may be extremely intriguing. This also explains my decision to pursue a postgraduate degree specifically in operations research. Industrial engineering as a course also provided a suitable platform for understanding the "bigger picture" – the money, materials, technology and people – in the context of an optimisation problem.

What was the topic of your Master's research?

The aim of my research was to elucidate conceptually how information sharing can benefit inventory management in a pharmaceutical supply chain. I have implemented reinforcement learning within a simulation modelling environment to illustrate how effective inventory management policies may be learnt based on information shared in a pharmaceutical supply chain. A particularly interesting outcome of my research was a demonstration of how health-care facilities in close proximity to one another may exchange inventory between them in order to mitigate the risk of stock-outs in the short-term.

My research formed part of a larger concept demonstrator built for the South African National Department of Health. Sound information capturing and sharing are especially

relevant in our country's public health-care setting, because recent efforts aimed at enhancing information-sharing practices have been plagued by several implementation problems.

What are some personal milestones or accomplishments achieved in recent years?

I am very privileged to have been awarded the prestigious Gerhard Geldenhuys medal in 2018 for my final-year project titled "The relative effectiveness of destination dispatch in elevator control." In this project, I have developed an agent-based simulation model in order to investigate the claim that destination dispatch elevator control is significantly more effective than a selection of conventional elevator control algorithms.

According to a destination dispatch system, passengers register their destination floors in the elevator lobby before entering an elevator. The control system then immediately assigns a passenger an elevator to board or wait for. The algorithm is so effective because it can pre-cluster destinations for each elevator.

I also had the honour of being an author on the 22nd chapter titled "Computer simulation modelling" of the book, *Operations Research in South Africa – The first 50 years*, launched at the ORSSA Conference in September this year. It was a truly exhilarating experience to be part of the process and I would like to commend the editors (*HA Kruger and JH van Vuuren*) on a job well done.

A particularly rewarding experience for me was the opportunity I had this year to supervise an undergraduate industrial engineering student during her final-year project. It allowed me an invaluable opportunity to foster her development as a researcher, as well as to develop my mentoring skills.

What do you consider to be your top technical skills?

I am relatively well-versed in computer simulation model-

ling (specifically *AnyLogic*) having worked within the software extensively over the past three years. I am proficient in Java and have considerable experience with R, SQL and VBA. Although I am familiar with reinforcement learning, my supervised and unsupervised machine learning skills are relatively limited and I would love to expand on them in the future.

And what are some of your other strengths?

According to Gallup Strengthsfinder, my top five strengths are Achiever, Maximiser, Learner, Analytical and Relator. I am motivated to work diligently, and I take pride in doing a task as well as possible. Furthermore, I have a great desire to learn and enjoy playing a leading role in a group environment.

What vacation work experience have you accumulated during your university years?

I have enjoyed four stints as a student intern at different companies during my undergraduate years. I worked at an asset management company, a large South African food producer, a manufacturing company as well as at a small consulting company which all allowed me to hone a variety of interpersonal and technical skills.

What are your career prospects?

I am very eager to pursue a career in Operations Research, or a career involving at least some element of operations research. I am interested in career opportunities involving, but not limited to, data analytics, machine learning and optimisation.

What other hobbies do you enjoy?

I enjoy outdoor activities, specifically mountain biking and hiking. If I am not outside, you may find me immersed in either a crime fiction novel or a self-improvement book.

For a complete CV, please contact Marno at marnodp@gmail.com or www.linkedin.com/in/marnoduplessis

ORSSA JOHANNESBURG CHAPTER AGM

by *Dave Evans (davevans@gmail.com)*



Dave Evans

The Johannesburg chapter held its AGM on the evening of Wednesday 27th November, generously hosted by Discovery in Sandton, for which our thanks.

The meeting was preceded by a film on Data Science, made by an American company called Dataiku, who describe themselves more as 'AI'. They had interviewed a broad spectrum of high profile people in data science from all

over the world, and covered most aspects of data science and a lot of the issues involved, touching on, amongst many others, some of the ethical aspects and one well known for many decades to OR practitioners: how to 'sell' both what it is, and its value. It was pitched at a level which worked well for our audience, being both a good overview, as well as looking at some provocative angles.

Some 30 members and guests attended the film, and eleven stayed on for the AGM.

The chairman, David Clark, reported on another very successful year for the chapter, with several well attended events and some 22 Meetups, the latter held variously in Parkhurst, Rosebank and Sandton. The events included the 'Pi day' and Ada Lovelace Day, which are now fixtures in our calendar, with the second being a talk by Amira Abbas from the Quantum Research Group at the University of KwaZulu-Natal, on quantum computing and applications to Machine Learning; a Nelson Mandela Day workshop, in which several people participated in finding open source data sets and adding them to a public github site OR4SA, and a talk on the "OR" that goes into winning the Dakar Rally, by Tim Brinkmann from Toyota Gazoo Racing, which won the car category in 2019.

The treasurer, Dave Evans then gave his report, indicating that in the financial year in question (2018) the chapter's funds had increased slightly. As at this AGM, the balance has fallen by almost R4 000, with the expenditure being entirely on costs associated with the events held in 2019. The chapter's membership fees are expected before the end

of the year, when the financial situation will again be on a sound footing for 2020.

The new committee for 2020 was elected as follows:

- **Chairman:** David Clark
- **Vice Chairman:** Handre Williams
- **Secretary:** Jess Rees
- **Treasurer:** Dave Evans
- **Add. members:** Rob Benetto
Liesl Hendry
Gemma Dawson
Melusi Magele

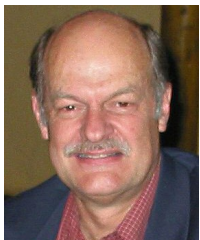
The meeting then discussed several ideas for possible activities in 2020, and the national conference, which the Joburg Chapter will be hosting in 2021.

The chairman thanked the committee for their contributions through the year, and the members for their participation at events. The meeting in turn thanked the chairman for the excellent leadership he has provided to the chapter throughout a very successful year.

BOOK REVIEW: ESSENTIALS OF BUSINESS ANALYTICS

AN INTRODUCTION TO THE METHODOLOGY AND ITS APPLICATIONS

Written by Hans W. Ittmann (hittmann01@gmail.com)



Hans Ittmann

One of the major trends over the last number of years that affects organizations in every sector of the economy is the need to move towards more accurate, data-driven insight to achieve effective decision making. Data now have the power to help businesses succeed, however, this can only be achieved through appropriate and proper analysis. Business analytics is no longer a buzzword but an essential capability that provide the necessary means for such analysis. It draws on tools such as operations research, statistics, machine learning, data management and data visualization.

The main objective of *Essentials of Business Analytics*, as stated by the editors, is threefold namely:

- to fill the void in the graduate-level study materials for addressing business problems in order to pose data questions;
- obtain optimal business solutions via analytics theory; and
- ground the solution in practice.

The book consists of three, almost equal length, sections or parts. Part 1 focusses on Tools while Modelling Methods is the essence of Part 2 and Part 3 contains advanced Applications as well as several case studies.

The first four chapters in Part 1 address all aspects of data, namely, the collecting of data, and issues related to this, data management with specific emphasis on relational database systems, big data management as well as data visualization. In all chapters, and that is the case throughout all chapters in the book, examples and applications are used to illustrate the concepts covered in the specific chapter with online appendices where applicable. For operations researchers these few chapters are of immense importance and very useful since the emphasis in their studies is typically on quantitative techniques and methods, and not so much on data aspects.

The following three chapters in Part 1 are devoted to statistical analysis of data. The statistical methods that are introduced are basic inference, regression analysis and advanced regression analysis. The statistical methodology covered in these chapters are comprehensive. What is very useful are the exercises at the end of each chapter, the references provided as well as the frequently asked questions (FAQs). Furthermore, in each chapter, reference is made to software, typically used in industry, for analysis purposes and these are used in the examples for illustrative purposes. The major software tools used are R, Python, MS Excel, and MYSQL. A final chapter in Part 1 focusses on text analytics.

Simulation and optimization are the two classical OR

methods that constitute the subject matter in the first two chapters in Part 2. The concept of simulation is introduced, and this is enhanced to how simulation is used for decision making under uncertainty. The optimization methods covered are linear programming, integer programming and non-linear programming. Various aspects related to using these methods are presented as well as how to use Excel Solver for solving real life problems. Forecasting Analytics is the topic of the third chapter of Part 2. Here again various methods such as exponential smoothing, trend and seasonality and time series are presented and discussed. Ample use is made of examples in each case. The next two chapters in Part 2 cover topics not that familiar too operations researchers, these are Count Data Regression and Survival Analysis.

Machine learning, unsupervised and supervised, is the subject of chapters 15 and 16 in Part 2 respectively. This field has evolved over the last several decades but has become much more prominent recently. A large collection of modelling paradigms—including the unsupervised learning paradigm and the supervised learning paradigm, are discussed in these two chapters. For unsupervised machine learning, methods of projection, clustering, density estimation, itemset mining, and network analysis are covered. Supervised machine learning algorithms can apply what has been learned in the past to new data using labeled examples to predict future events. Again, ample use is made of examples, with the corresponding code showing how the problems are addressed, while exercises are provided at the end of the chapter, as is the case for all chapters.

Deep learning, a rapidly growing area of machine learning, is outlined in the last chapter of Part 2. The aim is to provide an understanding of the concept, discuss various popular deep learning architectures, and provide guidance on how to perform image analysis and text analysis using deep learning.

In Part 3 a chapter is devoted to each of the following applications: retail analytics, marketing analytics, financial analytics, social media and web analytics, healthcare analytics, pricing analytics and supply chain analytics. Each of these applications are outlined in detail and various aspects are described in a way which familiarizes one with the application area. Detail on how the tools and modelling methods can be used and applied for each of the applications are outlined. Three case studies from the insurance, airline and

media industries respectively are presented. All three provide great insight into how the theory covered in the book can be used for effective and improved decision making.

The final chapters provide an introduction to R and Python, both programming languages, as well as Probability and Statistics. All three of these are extensively used in the examples provided throughout the book.

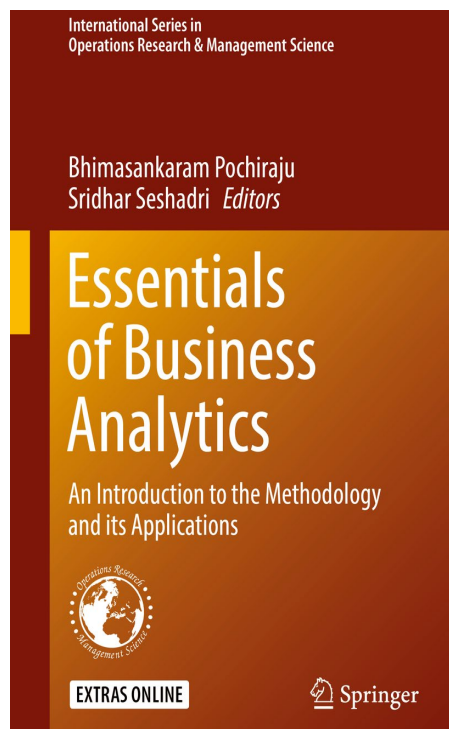
Apart from the two editors there are a total of 24 collaborators. What is noticeable is that most of these collaborators, as well as the editors, are from institutions in India. It could create the impression that the book is only intended for an Indian audience. This is certainly not the case, academics and practitioners world-wide will find this an excellent textbook while it can serve as a self-study guide for professionals who wish to enhance their knowledge about the field.

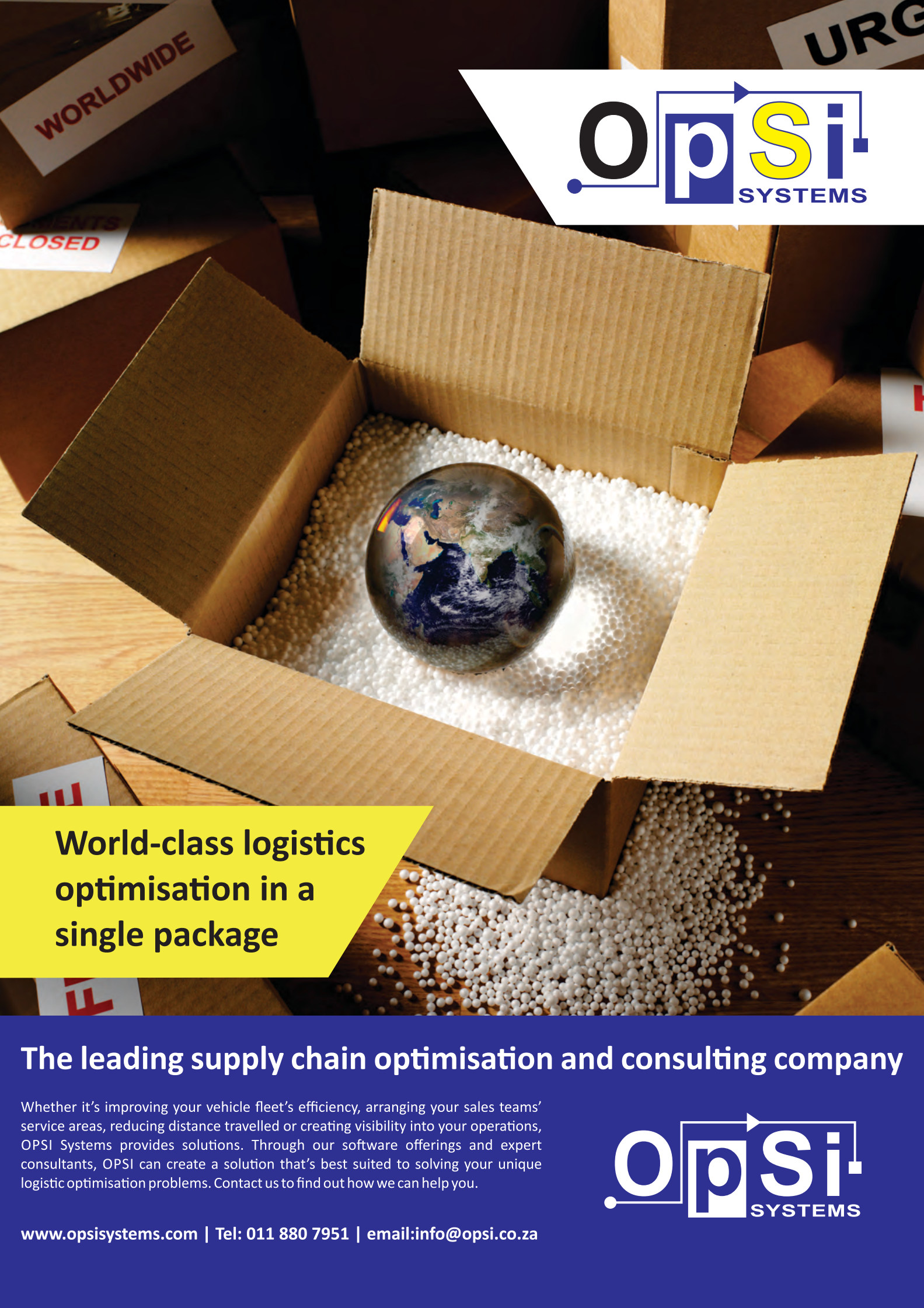
Data scientists, statisticians and operations researcher will find this book of value. However, the exposure to OR methods and techniques is limited. For anyone that wants to enhance their knowledge of OR and pursue a career in OR this book is only a start giving valuable understanding and insight into all aspect of data as well as the basics of probability and statistics. However, textbooks covering more advanced OR techniques will be required for those interested.

The *Essentials of Business Analytics* covers a massive amount of material, both in breath and in depth. It

is impossible to do justice in a short book review to the material that is the subject of this book. What stands out in all the various chapters is how concepts are introduced in a relatively simplistic way, built upon, enhanced and in a logical manner taken to a more advanced level with increased complexity. As indicated above the book can serve as a comprehensive textbook for graduate students as well as for practitioners. In this regard it is a very useful source, and guide, for brushing up one's know-how of a specific topic or to learn something new. This book is a timely and welcome addition to the growing literature on business analytics.

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