



# *AT THE FOREFRONT OF ANALYTICS IN AFRICA*



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The Operations  
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ORSSA

## ORSSA Newsletter

June 2020

# THE PRESIDENT'S DESK

**Gemma Dawson**  
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So much of the life we knew has changed since the last newsletter, and I have no doubt that when the third edition arrives later this year, we will be living in a world that remains relatively unimaginable. I hope

that you and your loved ones are doing well and keeping safe, warm and healthy!

During May, two ORSSA members have had national recognition that I would like to highlight.

Firstly, I would like to congratulate Professor Jan van Vuuren on winning the Douw Greeff prize from the Suid-Afrikaanse Akademie vir Wetenskap en Kuns. The prize is awarded to the best research or review article published in the Suid-Afrikaanse Tydskrif vir Natuurwetenskap en Tegnologie during the preceding year. Jan wrote an interesting article on the effect of multiple edge removals on the independence number of acyclic graphs. You can download the article from [here](#). Congratulations, Jan!

Secondly, Dr. Sheetal Silal was in the news after presenting the work that is being done by the South African COVID-19 Modelling Consortium. A video of the presentation can be found [here](#), along with reports that lay out the long-term projections at a national, as well as a provincial, level. Thank you to Sheetal and the rest of the consortium for doing this massively important work!

Next, I would like to address the current standing of the ORSSA 2020 Conference. Based on the current models, it is quite unlikely that we would be in a position to hold an in-person conference this year.

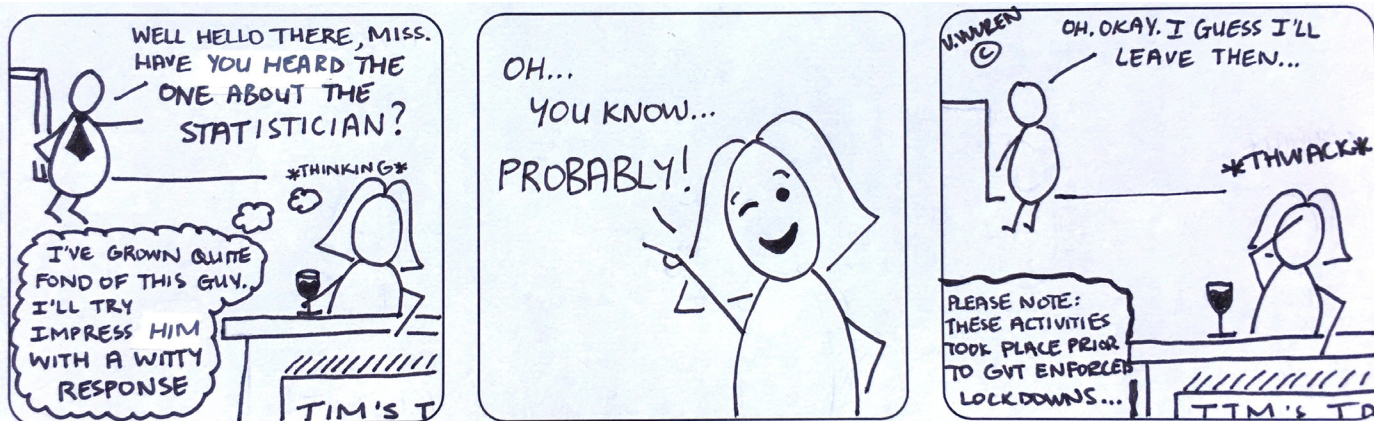
After much discussion, it has been decided that the 2020 conference in its current form will be cancelled. Please note that this does not affect the Student Competitions, Tom Rozwadowski medal, nor the Recognition Awards, as the society has every intent on presenting these awards later this year.

We are currently investigating the option of holding a virtual conference for this year. While this will never be an adequate substitute for the well-loved social aspect of ORSSA conferences, it does provide us the opportunity of making the conference accessible to those who would have been unable to join us this year. If you have any suggestions or ideas, I would like to encourage you to reach out to me at gemmadawson@gmail.com. Once a final decision has been made, the society will be notified.

I would like to thank Philip Venter and the rest of the LOC for all the hard work that they have put into the organisation thus far. It is by no means an easy feat arranging the ORSSA conference and they have done a remarkable job. Thank you, Philip and team, your work is greatly appreciated!

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## FROM THE EDITOR

## NEWS FLASHES



**Annelie Wessels**  
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I was getting quite nervous about the newsletter for this term, as everyone is trying to cope with the effects of COVID-19 and it seemed like the newsletter would be really short. As it got closer to the time, I was pleasantly surprised by the articles that were sent in. I was in the middle of my exams when this newsletter was compiled, so I really appreciate everyone contributing. The theme of this newsletter is "Looking back" and I am overwhelmed by everyone that shared their anecdotes and memories.

This newsletter is packed with a lot of reading material, some lighter than others. I think there is a good balance between a few academic readings and also a lot of stories to keep the spirits up during this uncertain times.

I am still in the Netherlands. I had to extend my stay as international flights are not yet open. I certainly grew fond of this place. I will miss it dearly when I have to come back home. With today's technology it is so easy to stay in contact with friends and family at home, I do not even feel as if I am far away. With that said, it was quite a challenge to adapt to all the different digital platforms they use here, especially for the exams.

I am especially enjoying commuting everywhere with my bike or by train. Even if I have to wear my "mondkapje". It also gives me inner joy when I can respond to people in Dutch or understand what they say, because they rarely speak English.

I enjoy the occasional sun and the fact that it is still light outside at 22:00.

I think you will enjoy this newsletter. It touches upon some of the things Gemma spoke about in her letter and also include a lot of links where you can read more about these topics.

Groeten uit Nederland  
Annelie



Photo: Marina Pienaar



**ORSSA - Operations Research Society of South Africa**

21 May at 16:49 • 🌐

Congratulations to ORSSA Fellow, Jan Van Vuuren, for receiving the Douw Greeff prize for a research article of outstanding scientific quality that was published in the SA Tydskrif vir Natuurwetenskap en Tegnologie (SATNT) journal during the previous year in which the prize is rewarded.

The article in SATNT, 38(1) (2019): "Die effek van veelvuldige lynverwydering op die onafhanklikheidsgetal van 'n asikliese grafiek"

Click [here](#) to see the awards or scan the QR-code.



**IFORS News**

@IFORS\_News

The IFORS Triennial scheduled for June, 2020 has been rescheduled to August 22-27, 2021. We look forward to seeing you there! More information will be forthcoming.  
[#orms](#)

Click [here](#) to visit the IFORS page or scan the QR-code.

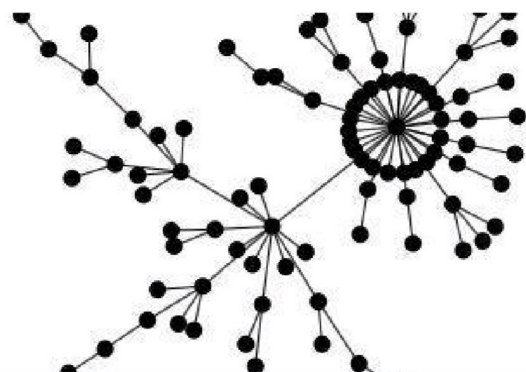


**The Operations Research Society of S...**

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2w • 🌐

The Johannesburg Chapter have taken their long running Analytics Meetup virtual. Sign-up for next Wednesday's morning chat on [#Meetup](#)



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## JOHANNESBURG CHAPTER GOING VIRTUAL



**Dave Evans**  
daveevans@gmail.com

Given the interesting times we live in – our Pi Day went for a loop – the Johannesburg Chapter decided to try something new on the evening of 23 April.

We already had a couple of virtual MeetUps and similar sessions, using Zoom, around the whole COVID-19 modelling approach.

The chapter committee decided to try a virtual seminar – again on Zoom. It started at 18:00, with 19 virtual participants, including the speakers.

Liesl Hendry gave a lightning talk on crafty ways of using R and D3 to generate labelling on the axes of plots which bears some resemblance to what you want, rather than the defaults, which never seem to be what you want. Why did that remind me of Excel...

Rob Benetto followed her, with another lightning talk, on the problems around pi in computers. The default way of storing a floating point number (i.e. one with digits after the decimal point) is as an integer (i.e. no decimal point), also known as a mantissa, and an exponent – the number of places to the right where the decimal point is. Obviously, there is a limit to the precision of the number, depending on how many

digits are being stored in the integer, and this varies, depending on which language/system you are using. Rob gave an example in R, where the value of pi was correct down to about the sixteenth digit – more than enough for most practical applications – but then total garbage after that. His talk explained how this could be handled better.

The third, longer, talk by Jess Rees, explained how natural language processing is done using neural networks, and how an approach called Attention, is used to improve it. The applications covered included translation, with an example from French to English. Jess pointed out that the success is very dependent on the size of the ‘corpus’ used to train the application, i.e. the body of words which is available in both languages, and applications for several of the RSA languages are rather limited because the ‘corpus’ available may only be things like the government gazette, which has a very narrow spread of content.

The talks were followed by several questions and discussion. The seminar lasted an hour, and seemed to have been well received by the attendees. All the presenters and organisers were thanked for a very successful seminar, particularly as it was our first virtual one.

Given the national president’s address on TV, some two hours later, it could be the first of several...

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## DR. LIESCHEN VENTER



**Lieschen Venter**

lventer@sun.ac.za

### 1. What did you study and how did you end up in Operations Research?

I graduated with a BSc in Mathematical Sciences, switched to a BCom honours degree in Operations Research (OR), and continued to an MCom degree in Operations Research before completing my PhD. I knew I wanted to specialise in one of the mathematical sciences and fell in love with the broad range of techniques and applications that OR offers. I knew I'd hate being stuck in a single industry and found that OR gave me the tools to operate in any industry.

### 2. Tell us a bit more about your Theology degree and how you decided on doing it?

I received a bursary from Sasol to complete my masters degree on the condition that I would relocate to Secunda as an employee after graduation. While there, I was a part of a church planting team for a local denomination. I had the energy but felt ill-equipped for such a task without a proper theological foundation. I graduated with a BTh honours degree in practical theology from the South African Theological Seminary and am very much the richer for it.

### 3. What did you do after your studies?

I started my career as an Operations Researcher at the Decision Support team for Sasol Technology based in Secunda. The plant looked like Mordor, everything smelled of tar and cabbage, but many young bursars started at the same time and it was like having a second student life. I was contractually bound only for the duration of my master's degree, but work was interesting, my church was growing, and the parties were pumping, so I ended up staying for longer.

### 4. When and how were you first introduced to ORSSA?

I attended my first ORSSA conference during my honours year when Professor Stephan Visagie introduced me to the Society. My talk was a mess, but I saw the power of networking first hand as I met Mar-lize Meyer, a principal Operations Researcher of Sasol there. My silly stuttering talk was the foot in the door I needed for the bursary and the rest of the story fell in place.

### 5. When did you decide that you wanted to come back to academia?

I grew frustrated with the financial constraints of

corporate work. There was so much I was curious about, but industry demands a client for every man-hour of work, which leaves so little room for exploration. I wanted to try new techniques and have the freedom to fail (and not cost my company millions in the process). I knew academia was the only place that could offer me the freedom to be a curious researcher.

### 6. You received your PhD in March, can you elaborate a bit on your topic?

I imagine my students all mouthing in unison "The South African education system is in crisis". But it is. South Africa has one of the highest measures of economic inequality and one of the worst performing basic education systems in the world. I used a system dynamics simulation approach to analyse the complexity of the system to find out why our system is so broken. The problem is massive and is making many more subproblem babies. More information about these is available on the site for my research group at [step.org.za](http://step.org.za).

### 7. How did you decide on this topic?

Dr Marietjie Vosloo and I were colleagues at Sasol and I was commissioned by her for work at the Inzalo Foundation. We used a system dynamics approach to model the sustainability of the Sasol bursar pool, given concerns with the waning quality of the basic education system, especially for learners interested in STEM (Science, Technology, Engineering and Mathematics). It was during this time that I understood the problem to be much larger and of much greater concern to national economic stability.

### 8. Do you have any plans for a post doctorate or something related in the future?

I'll be focussed on the outputs of my research group for the next few years. We hope to collaborate more closely with governmental policy makers and apply our simulation models directly to test schools.

### 9. What subject or year do you enjoy lecturing the most and why?

I really enjoy the optimisation and decision theory at third year level. Seeing students find the mathematics in a wall of natural language text is kind of lovely, and seeing new pathways in their brains form as they learn how to think in objective functions and constraints.

### 10. What part of your job do you like most?

The camaraderie within the Department of Logistics at Stellenbosch University is by far my favourite part of my job. We spend so much time complaining and crying and laughing and eating. Work often feels more like home than an office. I'm lucky to be a part of an OR team where everyone truly wants the best for

each other.

**11. What task do you always leave for last?**

I'm so hopelessly deadline focussed that I leave the task with the latest deadline for last. It's silly, but once I've seen a date for the task I'm just unable to complete it too long before that date. So if you want me to get something done earlier, please fib about the due date.

**12. What do you enjoy doing in your free time?**

I'm obsessed with deconstructing popular cultural trends, psychology (lately so much Jung), philosophy, and politics. My current meditation binge is on clowns: Their symbolic significance, their archetypal message, and their cultural relevance. I'm a member of KRUX Africa, a Christian study centre and I spend most of my free time trying to understand who and why we are with some philosophers and artists.

**13. How do you experience online teaching? (Any advantages/disadvantages/challenges?)**

There is a viral video of an American music teacher just screaming. That pretty much summarises my experience. The learning curve has been tremendous, the hours have been insane, the demands have been mammoth. The start-up cost has been huge, but in some sense worth it. I very much doubt we'll fully return to the old ways of teaching, even when the entire pandemic has passed. Maybe for the better - I hope so. It's too early to tell.

**14. How would you describe Operations Research in one sentence?**

Operations Research is the science and the art of picking a superlative and getting as close as possible to achieving it.

“ the science and the art of picking a superlative and getting as close as possible to achieving it

**15. What do you wish the world knew about Operations Research?**

I wish the world knew how much freedom the discipline offers. You receive a box of tools and get to pick which industry to apply these to. Your hammer, saw, screwdriver and nails are always with you, and you get to decide if you want to go to the hospital today or to the school, or the harbour, or the vineyard, or the fashion show, or the airport, or... or... or... It's the perfect discipline for those with commitment issues.

**16. You have been actively part of ORSSA for quite a while. Why do you think it is important to**

**have a national society such as ORSSA?**

I got my big (bursary) break by being a member of the Society. ORSSA's strength has always been its networking. The community is small, and finding your place in it is endlessly important. Good opportunities appear so organically within a healthy fellowship. Our greatest strength is also the thing we must endeavour to protect the most. Actively participating in the Society is so important in keeping this volunteer-manned ship afloat.

**17. If you did not pursue a career in OR, what other field might you have ended up in?**

My daydream is to run away and start a petting zoo in some remote town. I want to own all of the animals, rehabilitate the broken ones, adopt the orphaned ones. Maybe if I just had my own alpaca I wouldn't want anything else ever again.

**18. Looking back on your journey to where you are now, name:**

*A terrifying thing that happened to you:*

During my first year alone in Secunda I was in an accident when a truck rolled over my brand new first car. I had no idea about insurance claims and vehicle refinancing and interest rates and lost deposits and all those adult things scared the bananas out of me.

*An exciting thing that happened to you:*

I was chosen as one of the delegates to represent South Africa at the One Young World Youth Leadership Summit. I had the opportunity to meet Kofi Annan, Jamie Oliver, Bob Geldof, and Richard Branson and share some of my education research.

*A starstruck moment:*

During university holidays I earned pocket money in a bikini shop that made custom swimwear. One day Chris Chameleon came to the shop looking for a custom outfit for a Boo! show and I got to show him some prints and materials we had in the shop.

*A highlight in your life:*

The day I was able to hand in my PhD dissertation for examination. My supervisor, Professor Stephan Visagie had sparkling wine with me in my office, and I was so overcome by the decade journey we had together. He was my first OR lecturer, my honours degree research project supervisor, and my masters degree supervisor. From my first encounter with OR to my final cap, he led me all the way.

*Something that you are thankful for:*

I'm thankful for having, sometimes if only on paper, answers to all of the big questions. I'm thankful to have some silence for the existential why's, the forever whats, and the unending hows. Even when I forget them in the worst ways possible, I'm thankful to be brought back to the centre every time.

# ORSSA REMEMBERS DR. PHILIP FOURIE

6 September 1941 - 4 June 2020

*Compiled by Gerhard Geldenhuys and Jan van Vuuren*

Dr. Philip Fourie, the 24th President of ORSSA, passed away in Somerset West on 4 June 2020. He was 78 years old and is survived by his wife Lenie and three daughters.

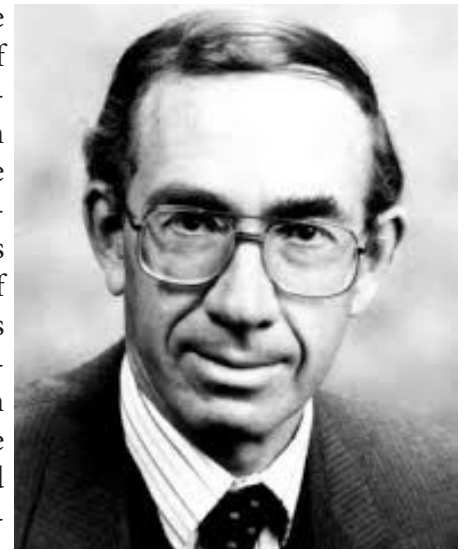
Philippus du Toit Fourie matriculated from Klerksdorp High School and studied at Stellenbosch University (SU), where he obtained an MSc in Physics cum laude. He started his career working for the Atomic Energy Board, during which time he also obtained a PhD in Nuclear Physics from the then Rand Afrikaans University (now the University of Johannesburg) in 1972. In the same year he was appointed as a senior lecturer in the Department of Applied Mathematics at SU, where he immediately became involved with operations research, amongst others, by developing and presenting postgraduate courses on world models and system dynamics. This also led to collaboration with the Unit for Futures Research at SU. Another area of his research interest was the mathematical modelling of fuel consumption as a result of road transport. This was done as part of the National Programme for Energy Research and in collaboration with the Centre for Transport Research at SU.

He had a wide range of interests, from classical music, literature and various conservation issues to tennis, mountaineering and sustainability. He also had a strong sense of civic responsibility. The new political dispensation in South Africa led him to see opportunities for operations research in the government's Reconstruction and Development Programme (RDP). In particular, he embraced soft operations research and community operations research as valuable approaches towards solving problems within the scope of the RDP. He also applied techniques from these realms to provide decision support to the local municipality of Helderberg in terms of equitable and sustainable resource allocation decisions.

He had a deep interest in pedagogy, and prepared his lectures meticulously. The many innovations he introduced into his lecturing style over the years were appreciated by his students. Just before his retirement in 2003, he collaborated with his colleagues in establishing a novel and highly successful, project-driven post-graduate course in operations research aimed at bridging the gap for students between academia and industry in which very close industry collaboration was achieved [2].

He was also passionate about contributing his ex-

pert knowledge in support of sustainable development. In this respect, he associated himself with the ideas of Russel Ackoff on operations research and development. From this perspective he developed tools for assessing sustainability



after his retirement, and applied these tools to Lynedoch EcoVillage near Stellenbosch, the first ecologically designed, socially mixed, intentional community in South Africa [1]. He also collaborated with various academics and business people in the drafting of a strategic management framework for the Kogelberg Biosphere Reserve, for which he served as a director and Vice Chairperson. This framework pertained to the clearing of alien vegetation, the processing of alien vegetation into building material, establishing sustainable housing and carrying out river clean-ups [3].

He served on the National Executive Committee of ORSSA as Additional Member during the period 1997–1998, as Vice President during the periods 1998–1999 and the calendar year 2002, and as President during the period 1999–2001. A Category I ORSSA Recognition Award was bestowed upon him in 2007. This award is conferred on retired members of ORSSA for outstanding contributions to the profession of Operations Research and/or exemplary service to the Society over a long period of time.

[1] Fourie PduT, 2006. Lynedoch EcoVillage: An experiment in sustainability, ORSSA Newsletter, December, pp. 6–8.

[2] Fourie PduT, Nieuwoudt I & Van Vuuren JH, 2003. Methods of OR: A new graduate course, ORiON, 19, pp.1–31.

[3] Harmse MFP, 2019. Operations Research for Development, pp. 359–384 in Kruger HA & Van Vuuren JH (Eds), Operations research in South Africa: The first 50 years, African SunMedia, Stellenbosch.

# BEHAVIORAL OPERATIONAL RESEARCH - A CAPABILITIES APPROACH

Behavioral Operational Research – A Capabilities Approach by Leroy White, Martin Kunc, Katharina Burger and Jonathan Malpass Eds., 2020, Palgrave Macmillan UK, Hampshire UK, pp. 392, ISBN 978-3-030-25404-9 (Print) and ISBN 978-3-030-25405-6 (eBook), 139.99 EURO (Hardcover), 109.99 EURO (eBook).



**Hans W. Ittmann**  
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Little or no attention is given to the role humans and decision-makers play in the development of quantitative models. Typically, the techniques and modelling approaches operations researches are taught

assume rational and perfect decision-makers. The reality is that OR techniques mostly fail to consider human behavior with the result that proposed problem solutions do not play out as expected when implemented. As a result, in line with growing research in other fields, there is a renewed interest in and emphasis on Behavioral Operations Research (BOR) with the focus on the decision-maker as a human being as well as the associated aspects such as cognitive biases that affect decision-making.

This book, Behavioral Operational Research: A Capabilities Approach, is a timely addition to the acclaimed book Behavioral Operational Research: Theory, Methodology and Practice compiled by basically the same editors. (A review of the first book appeared in the ORSSA newsletter - Ittmann, 2017). Many of the ideas and concepts that were raised and included in the first book are further developed in this new book. In addition, given the current worldwide emphasis on automated decision-making new opportunities such as “human-in-the-loop” are discussed.

In this book the editors endeavour to further develop the ideas and concepts underpinning BOR. An important goal is to illustrate that BOR appears to be an increasingly inter-disciplinary field and, in this way, show a return to the multi-disciplinary origins of OR. BOR is defined as “the study of the effects of psychology, cultural, cognitive and emotional factors on our thinking and action with the use of (advanced) analytical methods and/or models, to solve complex problems, support perplexing decisions and improve our ever-changing organizations”.

The central premise of this book, as stated by the editors is: “to focus on the ways in which OR practitioners as model-builders, as facilitators of modelling

processes, and as users of models deal with incomplete and imprecise information, subjective boundaries, uncertainty and iterative learning processes in support of the organizational problem-solving resources and decision making practices”. To enable this the challenge is how to orchestrate existing competences, skills and know-how, and capabilities, generating valuable outcomes, in new ways by incorporating these into OR approaches and practices.

The book is divided into four Parts addressing capabilities and competences specifically. Parts 1 and 2 contain material that focus on competences within and beyond models while Parts 3 and 4 cover capabilities within and beyond models, respectively.

The four chapters in Part 1 explore Competences With(in) Models. The similarities and differences in competences and capabilities between Behavioral Operations Management (BOM) and BOR are considered in Chapter 1. Various insights as to how BOM competences can benefit the BOR practitioner are provided. For example, in the case of BOM normative models are mostly used with an optimal solution defined, whereas BOR typically uses normative modelling methodology for problems that may not have an optimal solution. The following three chapters consider different technical skills associated with managing the impact of heuristics and biases on normative models. In Chapter 2 the focus is on the well-known newsvendor problem and behavioral implications of “demand perception” in managing the inventory, something that has received a lot of attention in the literature. An experimental approach to understanding biases related to this problem is described. The attitudes to risk and biases of financial stakeholders in portfolio selection is the topic of Chapter 3 while insights into how bidder behavior, during auctions, can be incorporated in models are outlined in Chapter 4.

Competences Beyond Models is dealt with in five chapters of Part II. It provides insight into how skilled expertise in techniques permits greater quality in scientific decision support, as well as, how to mitigate, overcome or incorporate knowledge of biases, ambiguity and uncertainty. An explicitly behavioral view of the subject of uncertainty modelling in Multi-Criteria Decision Analysis (MCDA) is described in Chapter



5. This is illustrated using probabilities and scenarios since both these involve important behavioral issues. Enabling divergent thinking is a challenge for any modelling approach. In Chapter 6 this is addressed by considering the approach, most suitable, for representing different values, goals and knowledge when engaging and involving stakeholders in a participatory modeling process.

A literature review of spatial MCDA, i.e. integrating geographical information systems (GIS) with MCDA, is provided in Chapter 7. The objective is to initiate exploration, and a preliminary discussion, of behavioral aspects, where human judgment is involved in both the design of spatial MCDA models and in the interpretation of results. The next chapter is also a literature review which, in this case, endeavors to give a comprehensive overview on how BOR improves project managers' capabilities to make decisions in the project management domain. It is for example of value to know what the key behavioral issues are for project decision-making. The final chapter in this part, Chapter 9, provides a practitioner view on how to manage bias in transformation projects. The aim is to examine the unconscious effect of optimism in transformation programs and a practical calibration toolkit is proposed.

Part III that covers the concept of Capabilities With(in) Models addresses the skills required to understand group behavior in the modelling process. The role of the OR practitioner encompasses more than just creating a model and these are addressed in Chapter 10. Various behavioral factors such as facilitating the project, determining if and how behavior might be relevant, collecting data about behavior and incorporating that behavior into the model is critical to the role. Finally, it includes assistance needs to be provided to support any changes to behavior that is part of the model outcome. In Chapter 11 the usefulness of developing problem structuring capabilities, as part of BOR, is discussed.

The role of stakeholders is very important in the modelling process. Both the next two chapters address aspects relating to this issue. In Chapter 12 the aim is to address the issue of involving stakeholders in OR more explicit, as well as the reason for involving stakeholders, and implications for how to involve which of the stakeholders. Chapter 13 considers insights and lessons learnt from non-OR related projects while the last chapter in this Part explores how increasing the transparency, or understanding, of OR models can improve the usefulness of the models.

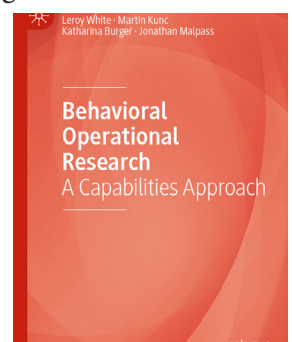
Capabilities Beyond Models, Part IV, covers a variety of aspects concerning the skills that BOR practi-

tioners need in order to manage the process of an OR project. The first chapter in this part focusses on transformation projects. These are projects that originate from the need for an organizational change. The case study outlined in this chapter considers how the needs of different stakeholders must be balanced to achieve the transformation objective. A further case study is presented that highlights all the aspects required for achieving collective group behavior. Personal data is considered one of the most valuable assets for businesses. However, people behavior indifferently towards this asset. In Chapter 17 customer behavior and the impact on the organizations collecting personal data are explored. The penultimate chapter addresses "philosophical issues in the collection and interpretation of OR data" with a plea that BOR practitioners embrace the philosophical principles of behavioral science. As one would expect the final chapter focuses on what the future holds for BOR including future directions.

Some 32 researchers and practitioners, interested in OR and behavior, have contributed to this book. Their views, covering a range of behavioral OR issues, vary as some are convergent, some divergent while others are controversial. It brings a richness to what is presented and will stimulate further discussion, thinking and research on these topics. An interesting observation is the interplay with other levels of inquiry that is apparent in all chapters, contributing to inform much of the new discipline of BOR.

While writing this review the Covid-19 virus and pandemic is sweeping across the world. Modellers are developing a variety of models to assist governments in their decision making. Human behavior in the form of social distancing, wearing of masks and washing of hands are some of the important measures to counter the spreading and transmission of the virus. It is critical to incorporate these behavioral issues into many of these models. It illustrates the importance of what is covered in this book. Behavioral Operational Research – A Capabilities Approach is a useful, and timely, resource to the growing literature on BOR and it adds clarity, as well as the necessary substance, to attaining a better understanding of BOR.

Ittmann, HW, 2017, Book Review: Behavioral Operational Research - Theory, Methodology and Practice, ORSSA Newsletter, March 2017.



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## COMMUNICATE YOUR SCIENCE



**Luré Viljoen**  
lureviljoen@gmail.com

I completed my Honours degree in Quantitative Management in 2019. I thoroughly enjoyed the subject during undergrad and decided to further my studies in that particular field. We received our honours

assignment in the beginning of 2019 and my topic was focused on space allocation. The objective of my research assignment was to develop a methodology to determine the best allocation of space in a specific retail store between different departments.

Store space allocation is one of the most important processes which any retailer needs to take into consideration when planning a new store or upgrading a current store. This concept can determine the success or failure of any retailer. A case study of a South African retailer was considered in my research assignment. A linear programming model was presented, in which the difference between the percentage space allocated to each department and the percentage sales contribution of each department was minimised. The results presented a better allocation of space than the current allocation in the store. These results need to be implemented for a test period to confirm that the new allocation will be more beneficial to the store

than the previous allocation. Recommendations were made and ideas for further studies included a closer look into each department, focus on the product itself and not the department as a whole, because different products in each department have different marginal benefits and effects on the sales and profits of the store. Sales elasticity is a big concept to take into account and could be considered as a potential future research assignment.

Through this assignment, I have not only developed my problem solving and analytical skills, but personal skills such as time management, trial-and-error, endurance, technical capabilities and my interpersonal skills which I can apply in my everyday life.

I had so much passion for this research assignment, with the help and support from my study leader, Professor Stephan Visagie. Professor Visagie allowed me to make mistakes and learn from them. Sometimes he challenged me a lot, but through that I gained more endurance and knowledge. We went back and forth to find a solution, but in the end, we managed to write our own linear programming model to allocate space to different departments in the store. I feel much more confident going into the work environment after this crazy Honours year.

I want to adapt the quote that reads “sometimes the questions are complicated, but the answers are simple” to “sometimes the coding is complicated, but the solutions are simple”.

## LOOKING BACK AT THE HISTORY OF EURO AND ORSSA



**Theo Stewart**  
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To some members of ORSSA it may seem strange that we are affiliated to EURO (the Association of European Operational Research Societies within IFORS), which certainly at face value seems anomalous.

But there is a clear historical reason for this affiliation, and it brings important potential benefits to ORSSA members, especially emerging researchers. In fact, Tunisia is also an African member society of EURO.

EURO was the first regional association of IFORS member countries, but others did follow, with the Asian-Pacific (APORS) and Latin-American (ALIO) associations later coming into existence. IFORS came to realize that these groupings needed a more formal

constitutional recognition, which was adopted from 1987 with the establishment inter alia of regional vice-presidents elected by each regional association. A North American Association (NORAM) was created with the more-or-less sole purpose of electing a vice-president to represent USA and Canada. Mexico is represented in ALIO.

That left ORSSA without VP representation and we objected! Some even suggested that we should affiliate to ALIO, but we did not have too many Spanish and Portuguese speakers, while transport links across the south Atlantic were problematic. EURO seemed to be the best option, but given the political situation in the 1980's, many in Europe were reluctant. The 1990's brought the needed changes and we were finally admitted to EURO.

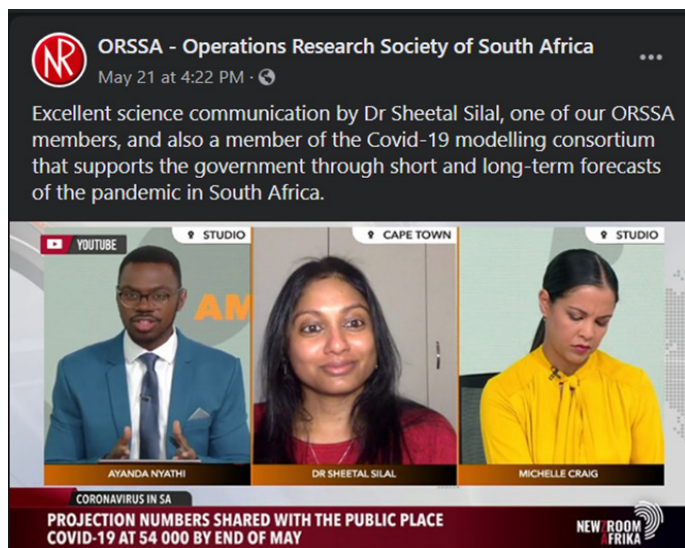
The activities of EURO are best seen by visiting the home [page](#). Do sign in with a user name as it helps EURO market the extent of OR activity worldwide.

The following are some of the activities that may be of interest and value, especially to emerging researchers (for whom various support packages are often made available by EURO):

- The flagship EURO-k conferences in years in which no IFORS conference takes place, and which are awesome events;
- EURO mini-conferences on specialized research themes;

- EURO Summer/Winter Institutes, bringing together leading experts to address workshops attended by emerging researchers;
  - PhD Schools for current doctoral students in a selected area;
  - Many EURO working groups offering a variety of opportunities for networking and workshops.
- The opportunities are all-encompassing and really exciting!

## COVID-19



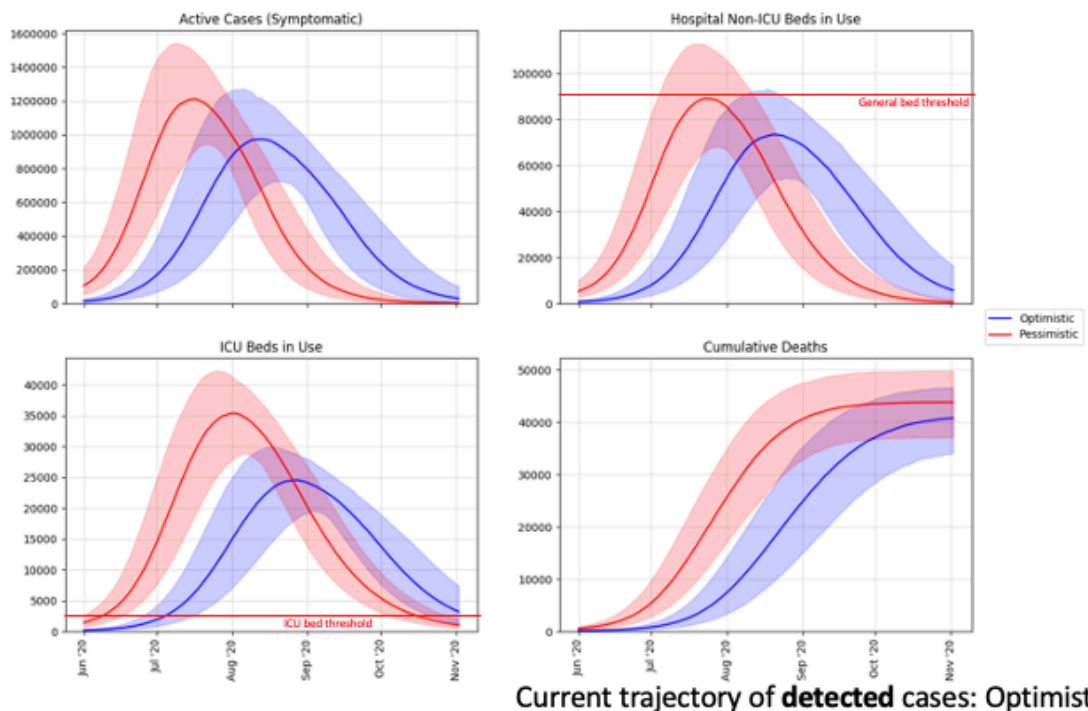
COVID-19 is a name that comes up at least once or twice (or 34 times) a day. It is interesting (maybe alarming or terrifying) to see how people react to this virus that so drastically changed our whole world.

It changed how we greet each other, how we work, how we buy our groceries and how we socialize with our loved ones. It changed our day to day lives and our whole frame of reference.

To take a look at the projections for South Africa, visit [Masha's page for COVID-19](#) for the presentation by the South African COVID-19 Modelling Consortium.

It is important to note that forecasts are regularly updated, because of the difficulty of predicting far in the future, especially with a new virus.

## Long term projections: National



Estimating cases for COVID-19 in South Africa Update: 19 May 2020, S Silal et al, <http://www.masha.uct.ac.za/masha/covid19>.

## "LOOKING BACK" ANECDOTES AND RECOLLECTIONS



**Dave Evans**  
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I was still in the UK when ORSSA was founded; my first contacts with ORSSA were via AECI, who was a corporate member in 1971, when I arrived in South Africa. In addition to attending various seminars, I was quite involved in the preparation of Newsletters in those days. We had several very active ORSSA members at that time – Jim Buttery, Dave Bromley, Alan Hawcroft and Rob Eales come to mind – and we printed and distributed a hard copy A5 format brochure. Printing was done by AECI's in house printing department, on A4 two sided pages, so we had to be very careful with clear instructions on which photo reduced pages were going where, and then once that was printed right, the dozen people in our OR group were roped in. Stacks of A4 multi-printed pages, in the right sequence, were laid out on a large table, and the entire group lined up and went round picking them up in the correct order, and then handing them to the finishers who stapled and folded them and put them into envelopes which had the appropriate address labels on them! AECI was in the Carlton Centre in those days, so someone (frequently me, as I remember), then had to trot up to the Jeppe Street post office for a 'bulk post.' Do I need to say "Times have changed!"?

My recollection is that quite soon after my return from what's now Zimbabwe, in 1979, I was roped into the Newsletter Editor job, and I spent most of the following 40 years on the Executive Committee in one role or another, including two stints as national president, and a couple as Johannesburg Chapter Chairman.

What are my overriding memories? Obviously at any given moment, the Society is run by a nucleus of people on the national exec and the chapter committees – we can't all be on any of those teams at the same time. The consistent commitment and effort put on by those people has been outstanding, and it's been a steadily rotating set of individuals, so our deep thanks are owed to a large number of members. Likewise, the efforts put in by the Orion and Newsletter teams continue to be superb, and until you've had a role in any of these many activities, you can have no idea how much time and effort a lot of it takes.

I can't speak for other chapters, as I've only attended

half a dozen or so of their events, but from my experience of them, and many Joburg ones, again, the quality of all the talks and various other events, MeetUps now included, of course, has been great.

And I have to touch on national conferences – particularly as I've been involved in organizing some 10 or so, if I may blow my own trumpet for a moment. I have been to quite a few 'non-ORSSA' conferences of one sort and another over the years, and they really don't cut it – ours are in a league of their own. Apart from maintaining a standard of papers which is incredible, the social side is also incomparable. One of the obvious changes which has happened since the first one I attended is the student participation and the quality of what they now contribute – particularly after the conference dinner. I still remember trying to dance a quickstep with Winnie Pelser on one occasion at a rather late hour, with students who seemed to feel quite strongly that a quickstep might not be the correct dance!

Technology change over these years has obviously been enormous – apart from an electronic newsletter and everything that the internet and mind blowing computing power brings, our first AECI LPs had no more than 500 equations – working on the largest computer in Africa, that was the most it could handle! And all this development is a very two edged sword, of course – witness the war currently going on between Donald Trump and Twitter, although that has nothing to do with ORSSA. As far as I see, our use of the technology continues to be exemplary.

And through it all, ORSSA continues to be the natural and highly valued home of all of us who dabble in OR, Management Science, Analytics, Big Data – pick a label. Keep up the good work, folks – you're continuing to do a great job!



**Gerhard Geldenhuys**  
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When I look back at my involvement with operations research in South Africa, I realise that I can only speak from an academic background and from a Stellenbosch perspective, where I took an honours degree in pure mathematics in 1959 and did an MSc in applied mathematics in 1960/61. I shall also restrict myself to only a few observations.

In the late 1950's and early 1960's there was very little emphasis on research and certainly no expectation of publication of research results in research journals in these two departments. The lecturers, and in particular the professors, had very heavy teaching loads which by today's standards will be regarded as totally unacceptable. The ability to teach well was regarded as important in the appointment of new staff. In the department of applied mathematics, where I started my teaching career, complete type-written lecture notes in Afrikaans were provided for all courses, including post-graduate courses and courses in operations research. This in itself was a huge and time-consuming task. The heavy teaching duties and the writing of lecture notes left very little if any time for formal research. It took many years to improve the size of lecturing staff and to develop a favourable atmosphere for research. Today there is a very strong emphasis on research and the publication thereof in peer-reviewed journals. Today it would be unthinkable to appoint or promote a member of staff unless he or she has a good record of research publications.

In the late 1950's and early 1960's there were no digital computers at Stellenbosch University. I recall a small research project of my own in that era concerning game theory when I had to obtain an exact solution to a linear programming problem involving something like ten variables. This took many days of very hard work by hand, and continuous checking and correcting to obtain an optimal solution. The acquisition of digital computers by universities in South Africa in the 1960's was a very important step forward, both for research and for teaching. The advances in computing power over especially the past twenty years have been astounding and have had a huge impact on the teaching and applications of operations research.

In the 1960's and for two decades to follow there was no internet and no digital cellular phones. Communication with overseas colleagues was by air mail and response was slow. If you happened to need a publication in a journal that was not in your university library, it was quite an effort to get access to that information. The internet has brought huge changes to this situation and easy access to almost anything that you require. To build a network of researchers in your area of expertise or to join such a network has become a matter of course. This has been advantageous for the teaching, research and applications in operations research in South Africa. My impression now, more so than in the early years, is that there are South African operations researchers who have acquired a global vision of the impact of their work and

who reach out to countries beyond our borders where they could be of assistance or where they could acquire expertise or experience.

There is also the factor of size. Compared to 1956, when I was a first year student at Stellenbosch University, there is now probably ten times more students at this institution, with an appropriate increase in teaching staff. Accordingly, the volume of work that is done in operations research is also very much larger than in earlier years. It is perhaps a matter of concern that there has not been a comparable increase in the membership of ORSSA.



**Hans Ittmann**

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The request of the newsletter editor was to write a piece on my term of office as president of ORSSA, the year 1986/87. At that stage the term of office of the president was for one year only. This changed when

Gordon Erens took over from me in 1987. He was thus the first ORSSA president to serve for two years. However, contrary to the request I am going to reminisce about my year as vice-president. My predecessor was Thys de Vries, a close friend going as far back as 1968. We both served time together in the South African Air Force and later at the CSIR. When Thys assumed his term, as he stated in his presidential address: "On my first day as President of the Society I was transferred out of the OR Department in which I had been working for seven years". In his new job Thys was often out of the country for long periods and as vice-president I had to stand in for him.

The first thing where I was very involved in was the establishment and launch of the Natal chapter of ORSSA. All the formal correspondence between the chapter and the ORSSA Executive was via postal letters, totally unthinkable today! John Hearne initiated the process, on behalf of the Natal people, with a letter dated 10 January 1986. He went on a sabbatical and everything was concluded between me as stand-in president, representing the ORSSA executive, and Linda Haines, his stand-in. The chapter had its inaugural meeting on 10 June 1986 with Pat Rivett, a longstanding friend of ORSSA, of the UK as the guest speaker. The chapter sent a letter to the ORSSA executive, dated 12 June 1986, with the names of the chapter committee. A final congratulatory letter, the last of eight (!), signed by Thys de Vries was sent on 30 July 1986!

In 1986 ORSSA awarded Honorary Life Membership for the first time and as Thys de Vries was not around, I was responsible for most of the formalities around this. The first occasion was held in Johannesburg where the award was made to Prof BHP (Pat) Rivett from the University of Lancaster and later the University of Sussex in the UK. This occasion was handled by the Johannesburg chapter. Personally, I have no recollection of this event mainly because, if I remember correctly, I had already left for overseas to attend a conference and various visits, including a visit to Pat Rivett at his home in Brighton (he collected me at the station with his Cadillac!). In his handwritten acceptance letter Pat stated that he was “quite overwhelmed” and that “I shall accept the award with great pleasure”! Rivett was honored for his long, outstanding and important contribution to our society since before its inception.

As Thys de Vries was also unable to attend the annual conference, I not only read his presidential address but fulfilled all the presidential duties during the conference. The highlight of the 1986 conference dinner, held at Groot Constantia, was the second Honorary Life Membership award made to Prof Herbert Sichel, first President of ORSSA. In his acceptance letter he stated: “I feel greatly honored for this distinction”. What I remember of this occasion was how humble this great man was and his kind words of appreciation on accepting the award. The society paid tribute to a man that did more than anyone else to establish OR in mining, government, industry and commerce in South Africa.

In August of 1986 ORSSA also had the pleasure of playing host to Prof Tom Saaty, and his wife, Rozanne. Saaty ran a two day-workshop on his Analytic Hierarchy Process (AHP) and the AHP package, Expert Choice. Tom was also a collector of jokes and many of us received copies of one, or more, of the 13 odd joke books he compiled.

I must now scratch my head to remember what happened during my actual term as president!



**Marthi Harmse**  
kmharmse@mweb.co.za

Different people look back in different ways. For example, the Aymara look back to the future and forward to the past (Norman, 2013). For Arabs and Hebrews the future lies to the left and the past to the right. Some Australian Aborigine societies look west

to the recent past and east to the long past. I will look back to a past about 15 years ago.

In the winter of 2004, expecting my daughter’s little brother, Wim Gevers, then ORSSA president, contacted me and asked whether I would be available to serve as ORSSA vice president. At that stage the Vaal Triangle Chapter, which I chaired, was working with the local chapter of the Southern African Institute for Industrial Engineering to prepare a proposal for a joint conference for 2005. The conference would be generously sponsored by Sasol, based on a request which emanated from a strategic session on the marketing of ORSSA which was arranged by Wim in January 2004. The theme of the 2005 conference was Building towards growth and sustainability in SA and the guest speaker was Alexis Tsoukias, then president of EURO, whose opening address was on the challenge that sustainability presents for operations research and industrial engineering, and his closing address was on how multiple criteria decision analysis could be applied to construct meaningful and useful indices such as the human development index and pollution indices. Almost 150 delegates participated and ORSSA made a profit of more than R100 000 – quite significant for 15 years ago. Back to Wim’s request, I was honoured to be elected as vice president at the annual general meeting at the 2004 ORSSA conference in Bellville. This was the first ORSSA conference at which a presentation on sustainable development was made namely by Killian Manyuchi from SAPPI.

In 2006 I became ORSSA president and was privileged to participate in the EURO conference in Reykjavik in July together with Hans Ittmann, Lynette Kotze, Greg Lee, Theo Stewart and one other delegate from South Africa. The theme of the conference was OR for Better Management of Sustainable Development and I made a presentation on the optimisation of a coal value chain for improved sustainability. Social events included a visit to the Blue Lagoon, included in the 2012 National Geographic list of earth’s 25 most awesome places, and a function at Perlan, a cluster of six hot water tanks which supply hot water to Reykjavik and converted in 1991 to include an exhibition space, a planetarium, an observation deck and a restaurant. Besides the council meeting and most enjoyable president’s lunch, most of the South African delegation participated in a satellite meeting on 2 July at which the Euro working group on operations research for development (EWG ORD) was established. I served on the advisory board from 2006 to 2010 while Hans Ittmann and Theo Stewart still serve on the board. Like many other delegates, Lynette and I went to explore the rest of Iceland after the

conference. This conference and subsequent trip was a life-changing experience for me and I took my family back eight years later and hope to do so again...

In September 2006 the ORSSA annual conference was hosted in Pietermaritzburg inter alia to help revive the KwaZulu-Natal Chapter. The theme of the conference was Production scheduling and logistics and the guest speaker was David Ryan, then professor of operations research at the University of Auckland. His plenary talks were on optimisation projects in an aluminium smelter and in aircrew scheduling. In my opening address I referred to operations research as the science of better, which had David a bit sceptical since the definition is often used in a more theoretical than practical sense. At the end of the conference he withdrew his scepticism, which made me very proud of the actual difference operations researchers make in South Africa.

In July 2007 I was fortunate to participate again in the EURO conference, together with 13 other delegates from South Africa, in Prague. The theme of the conference was OR creates bridges and I made a presentation on Employment Equity through System Dynamics. Besides the council meeting and president's lunch, which is always a highlight, Theo Stewart, Greg Lee and I participated in a workshop on operations research for developing countries organised by the EWG ORD. In the evenings we got lost in the beautiful intriguing city of Prague and after the conference a Sasol colleague and I undertook a trip through the West Slavic countries. The Carpathian Mountains, Jagiellonian University, Malbork Castle and the Hel Peninsula are among the many fond memories.

In September 2007 ORSSA hosted an Operational Research Practice in Africa (ORPA) conference and an INFORMS/IFORS teaching effectiveness colloquium in Cape Town, incorporated into the ORSSA annual conference. Plenary keynote addresses were given by Pali Lehohla, Statistician-General of South Africa, Eric Soubeiga representing ORPA, James Cochran representing INFORMS, and Arabinda Tripathy. Alexis Tsoukias also participated. Besides local operations researchers, delegates participated from Austria, Burkina Faso, Ethiopia, France, Kenya, India, Italy, Mexico, Nigeria, United Kingdom, United States of America, and Zimbabwe. One of the many delegates who touched my life was Tabitha Mundia then from Kenya. My opening address was based on an exhibition hosted at the National Gallery in London from June to August 2006 called *Rebels & martyrs: the image of the artist in the nineteenth century*. I posed the question of what the image is of the operations researcher in the twenty-first century. In my closing

address I found that operations researchers are not gods, but definitely heroes of many sorts.

In 2008 Sarma Yadavalli succeeded me as president. The momentous task of welcoming the international community of operations researchers to South Africa therefore landed on his shoulders. Preparations for the 2008 IFORS triennial conference, which would be hosted in Sandton, were already well underway in 2004. Hence during my whole tenure as vice president and president the local organising committee buckled down under leadership of Hans Ittmann and including Dave Evans, Wim Gevers, Theo Stylianides, Gys Wessels, Sarma Yadavalli and me. I will always cherish the teamwork, creativity and enthusiasm which made the 50th anniversary of IFORS such a memorable event.

Different people look back in different ways. But sometimes the past and future look back at us in different ways.

Norman, D. A., 2013. *The design of everyday things*. Revised and expanded ed. New York: Basic Books.



**Brian van Vuuren**

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I served as newsletter editor from 2015-2019. During this time, the newsletter made the transition from print medium to exclusively soft-copy. The effort and cost involved with printing, packaging, labelling and mailing the newsletters (as well as the outdated list of physical addresses we had on record) prompted myself and the newsletter manager, Bernie Lindner, to let go of the traditional means of sending out hard-copy newsletters (that, along with the annual AGM reminder from David Clarke, stating that he read the newsletter online as soon as it came out, but loved the printed newsletter because it 'provided him with a new mousepad every few months...').

Gathering material for the newsletter was always a challenge - I relied on the tireless contributions of a few ORSSA stalwarts who regularly contributed interesting pieces. Among them were the likes of Hans Ittmann, Dave Evans, Rob Bennetto and more. I also really appreciated pieces from academics such as Jan van Vuuren, Linke Potgieter and Fanie Terblanche, who often provided group reviews, along with interesting pieces of the work their research groups/students were undertaking, providing valuable insight and a 'landscape of OR' for prospective students to



consider as a potential field of study. In my time as a lecturer, I referred many a student to these articles to provide context on what OR is.

I also relied heavily on my then colleagues at the Stellenbosch Unit for Operations Research in Engineering (SUnORE) and the Surgor research group, who not only assisted with the packaging and labeling of newsletters when it was still physically mailed out, but also provided endless research updates, chapter/group event reviews and even updates once they completed their studies which I included in the 'What OuR members are up to' section.

The most difficult edition to compile was always the September/October edition which reviews the annual ORSSA conference. So much wonderful and interesting research is presented at the conference (along with numerous fantastic social events) that it's hard (and tiring!) to capture the whole event in one newsletter edition. But, at the same time, I was always aware that, for some ORSSA members who couldn't attend the conference, it was their only window into what transpired at the annual event. I'd strongly encourage more ORSSA members who are able to attend the annual conferences to consider profiling one or more of the facets of the conference to assist the newsletter editor in compiling this edition and enlightening those who couldn't be there.

I'm hugely grateful for each and every contribution which was made to the newsletter in my time as editor. Even more so, I always appreciated the feedback and compliments I got from ORSSA members who'd enjoyed the edition. It takes quite some time and administration to get the newsletter out, so it means a lot to know that people are reading and enjoying it - it makes the hard work, time and effort worthwhile.



**Dave Evans**  
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Back in the dawns of history, before Skype and Zoom, we had an Exco who actually met in the flesh. We typically made a point of having half from Pretoria and Joburg, and half from Cape Town and Stellen-

bosch – I don't think there was a Vaal Triangle chapter then. Meetings were held alternately by half the committee at one end or the other, and as a 'thank you' to the members, an Exco dinner was held on the Sunday evening before the conference got properly started. One year, the conference was in the Pilanesberg, and quite a lot of us were staying in tented camps in the park, which no longer exist – I don't know if someone

got eaten one night... The Exco dinner was at Sun City. My family visited the Pilanesberg regularly – we still do – so I thought I knew my way around, even after dark, and brought several committee members back, drove to the relevant parking areas and pointed my car and the headlights at their tents, so they could find them. By now on my own, I drove to my parking site, got out of the car, now with no headlights on of course – it must have been around midnight. I headed merrily off (probably literally, as well as metaphorically) to my tent and must have taken a wrong turning, because after five or ten minutes of wandering around, flashing a torch at random bushes, I also didn't even know where my car was anymore! I had visions of spending my night with an arm round a leopard, trying to keep warm, when I tripped over what was clearly a braai. I shone my torch around, and sure enough, I was about a metre from my tent!



**Leo Tomé**  
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I fondly remember my tenure as Newsletter editor. I was roped in by (Prof) Jan van Vuuren at the 2002 conference during my Honours year in Operational Analysis. As a 22-year-old it was a privilege and opportunity for personal growth to sit on the executive committee with the likes of a Hans Ittmann, Jan van Vuuren, Wim Gevers, to name but a few.

At that point the society was under some financial pressure, and there were suggestions that the newsletter format be changed to only an electronic one and be emailed to members. I proposed changing to a gloss-colour format and marketing to advertisers, and in so doing generating an income stream through the newsletter instead. The committee agreed to the proposal and to back this 22-year-old student.

Hans Ittmann helped to secure an "anchor" advertiser in the form of SAS. Theo Stewart connected me with his publisher. The publisher agreed to sponsor two copies of Theo's book, Multiple Criteria Decision Analysis: An Integrated Approach, and other Operations Research related books which would be given to the book reviewer, and as a prize each issue. The initiative turned out to be a great success thanks to the support and encouragement of fellow members like these. Jan van Vuuren deserves a lot of credit as well. He probably worked just as hard as I did in my capacity as newsletter editor to make the newsletter a success, giving guidance, ideas for content, and proof-reading.

Something that I still fail to fathom, is how after having some of the most meticulous people I know on the proofreading team, and having reviewed the publication numerous times with a fine comb myself, I would open the first copy of the printed newsletter, walking back to the engineering faculty from the printers below Admin-A, out on the “Rooi Plein” at Stellenbosch University, and the “printing-error(s)” would simply jump into my eye as I paged through the copy.



**Cobus Potgieter**  
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I was fortunate to take over as newsletter editor of the ORSSA Newsletter from Leo Tomé in September 2004. Leo invested a lot of time changing the layout and format of the newsletter and building relationships

with OR-related advertisers to help offset the printing and distribution costs during his term. Furthermore, Leo decided to stay on in the then newly created Business Manager role so that I could purely focus on the editorial work.

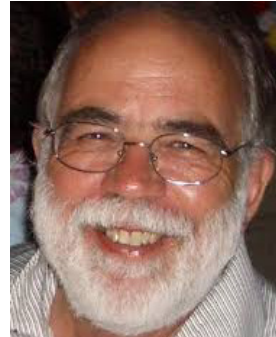
The template designed by Leo was in Microsoft Word and I used it mostly as I received it, with some minor tweaks here and there. Each edition completed on this template was subsequently converted to a PDF document and provided to SUN media for printing. The cover and back page as well as their inside pages were in colour; the back and inside pages usually comprising colourful adverts from our sponsors. The rest of the pages, containing the main content, were all black and white.

Getting content for the newsletter was always a challenging task, but the most taxing task came once the printed copies arrived back from the printers. Inserting each copy into its own envelope, printing all the addresses (after ensuring that you have the latest addresses of all members), ensuring that every envelope has an address and the correct combination of stamps, and dropping off the stack of envelopes at the local post office produced some frustrating but also some humorous moments.

There were too many contributors over the two years to acknowledge here. However, it is worth mentioning that most of the editions published during that time contained a book review by Hans Ittman. Also, Jan van Vuuren proofread almost all the draft issues before they were sent to the printers.

As I look back at my time as newsletter editor,

I recall a lot of hard work, late nights, but mostly positive memories and connections with people from ORSSA, and I realise that I received a lot more back than I put in. It was truly a great opportunity for me as a postgraduate student at the time and a wonderful experience. Thank you!



**Theo Stewart**  
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I was newsletter editor for the three calendar years 1973-1975. I was employed at the then National Research Institute for Mathematical Sciences (NRIMS) of the CSIR, and the period corresponds roughly to

my time of working on my PhD thesis.

The newsletter format was largely unimaginative. It was simply typed (no word processors!) on A4 pages (typically 2-4 pages long), the first page being an ORSSA letterhead. These were then Xerox'd. We folded them and inserted into envelopes which were tied into bundles of 50 to be taken to the post office. It was part of the duties of the newsletter editor at the time to maintain the data base of members' names, addresses and affiliations on punched cards. These were read in by a FORTRAN program to produce the labels for the envelopes.

Like all newsletter editors, I struggled to get members to send me newsy items. The content consisted largely of welcomes to new members and brief notices and reports of chapter meetings. No photographs, not even black and white ... they never copied well on the Xerox.

One innovation which I introduced was to obtain permission to reproduce a regular series of articles by Gene Woolsey published in Interfaces (published by TIMS, a forerunner of INFORMS), all rather witty anecdotal stories of quick and dirty OR applications. Gene was later to visit South Africa a few times and took to learning Afrikaans, but that was later.

I am pleased to say that these newsletters are available to peruse in the society's archives [here](#).

## 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, review, photo or any other contribution to the editor at [annalie99@hotmail.com](mailto:annalie99@hotmail.com).

# THERE IS A ZULU ON MY OR STOEP<sup>1</sup>

(with apology to the Leon Schuster movie)

*Anné Verhoef, School of Philosophy, North-West University*

*Hennie Kruger, School of Computer Science and Information Systems, North-West University*

Decolonisation has become a buzzword that everybody, especially those in the education sector, is talking about. Papers on decolonisation are produced regularly, presentations are given and workshops are conducted. At a recent workshop on decolonisation one of the delegates stood up and boldly stated that “gravity is gravity”. It was clear that this delegate meant that gravity (and all the associated formulae) remains the same in any culture and in any language (gravity, for those of us who had long forgotten our school physics, is the force that attracts objects towards one another, especially the force that makes things fall to ground – Cambridge Dictionary). To hear this profound statement was a huge relief – imagine the absolute chaos if gravity meant something different to people depending on their backgrounds or languages.

How about OR? Can we say “OR is OR” in every language and in every culture – is an LP model to maximise profit the same LP model regardless of the decision-maker’s background? The answer is “Yes, of course it is the same!” However, “gravity is gravity” or “an LP is an LP” has little to do with decolonisation or the decolonisation of a curriculum (particularly an OR curriculum). But then what is decolonisation and is it possible to decolonise a mathematical science such as OR?

There are some sophisticated definitions and explanations of what decolonisation entails which will not be covered here. In a broader context the decolonisation of a curriculum means that past inequalities and injustices need to be redressed by challenging the dominance of Western knowledge and the colonial roots of university practice. Wingfield (2017) states that the decolonisation of education means that a nation must become independent with regards to the acquisition of knowledge skills, values, beliefs and habits. These “definitions” should not be misinterpreted – it certainly does not mean that the existing education system (or existing curricula) must be overthrown. There should rather be an integration of knowledge and we need to, in the words of Wingfield, “develop curricula that build on the best knowledge skills, values, beliefs and habits from around the world”. If the South African OR community isolates itself in an all new African environment, how will we learn about advances and new OR theories developed

elsewhere in the world? We cannot completely separate our own knowledge, skills and values from, for example, Western influence.

The development of OR as a discipline is strongly rooted in Western ideas and knowledge. The decolonisation of OR does not mean that these Western influences will be done away with and that an exclusively African (Africanised) curriculum will be developed instead – this would be impossible. The decentring of Western ideas and knowledge can and must eventually take place. Jansen (2017) offers a number of different approaches of which two appear to be appropriate for an OR decolonisation process where new (African) knowledge is integrated with existing (Western) knowledge. Jansen calls the first process “decolonisation as additive-inclusive knowledge” and it involves the recognition of new, or African, knowledge and its addition to existing, or Western, knowledge. The second approach is called the “decolonisation as encounters with entangled knowledges” which entails doing away with “them” (the coloniser) and “us” (the colonised) while focussing on the intertwined knowledge of our entangled co-existence. In practice this may mean something like the following: You may prefer to see a traditional African healer when you are ill, but you will probably use your Western/Eastern mobile phone to make an appointment, or drive in your Western vehicle to visit the healer – and use an OR model to find the best/shortest route there.

Given this general idea of integrating existing and new knowledge, the question is “how can we decolonise OR?” Although there are a significant number of studies on the decolonisation of mathematical sciences, they do not provide clear direction or examples of how the decolonisation of OR can or should take place. It seems that the process of decolonising mathematics and engineering is still in its infancy. The decolonisation of OR is something that has not been attempted before, and together with the “pure sciences” finds itself generally in uncharted waters. This is not to say that there are no directions or clues that can be followed in the existing studies and in the theoretical work on decolonisation – the work mentioned earlier by Wingfield and Jansen are applicable to the question of decolonisation of OR.

A natural (and fairly easy) starting point to the de-

<sup>1</sup> This article is an adaptation of the work of Verhoef and Kruger (2019, 2020) and certain sections of the text were quoted verbatim from both articles.

colonisation of an OR curriculum would be to include examples from African history that are similar in nature to Western problem situations and which may typically be solved using OR models and/or techniques. The inclusion of such examples in an OR curriculum may provide those who have been marginalised by Western academia some legitimacy for knowledge that is embedded in their own history. Although the mere use of examples may not be sufficient for decolonisation, it fits the “additive-inclusion” and “encounters with entangled knowledges” proposed by Jansen (2017). In the subsequent paragraphs, a few illustrations in the use of OR examples in an African context will be given which will hopefully indicate that they may serve to restore colonised history in the context of OR and also aid in creating an “own frame of reference” for historically marginalised people. The focus will be on selected examples that show a similarity between classical OR applications and indigenous knowledge related to the warfare strategies of King Shaka Zulu – one of the greatest and best-known leaders in African war history, whose life and work has had a profound influence in South African history. This choice of warfare examples seems to be appropriate as OR was further developed during World War II when mathematical techniques were employed in warfare.

It should be noted that although Zulu warfare tactics will be presented in the context of OR, many more pre-colonial examples exist. See for example Verhoef and Kruger (2019) who presented a range of agricultural examples along with possible associated OR models. These include market days in pre-colonial Africa, maize production in West Africa, integration between grazing livestock, crops and wildlife management of the nomadic African tribes, etc.

Shaka Zulu was a leading figure in the military history of the Zulu Kingdom of South Africa during the early 19th century. He built an extremely strong army of Zulu soldiers and strived to transform the Zulu nation into the largest and most dominant nation in Southern Africa. To achieve this, he focussed strongly on military organisation and skill which led to an innovative battle strategy known as the “bullhorn” formation (Allen, 2014). The bullhorn tactic resembles a cow’s horns in that the Zulu army was divided into four sections, with the main body of the army being located in the centre (also called the chest), supported by another section (called the loins) behind the main body. Two other sections were formed on the wings (the horns) and would advance and encircle the enemy from behind. To illustrate how aspects of Shaka Zulu’s traditional warfare tactics may be linked to

possible OR applications we took a few well-known OR models and identified short selected quotes from the work of Allen (2014) that may be relevant to these applications.

According to Allen, Shaka Zulu “.... divided his soldiers into regiments ....”. This may be a typical assignment problem where people (soldiers) are assigned to tasks (regiments) based on criteria such as age, skill, physical abilities, etc. It may also be a labour planning problem, where staffing needs (number of soldiers) over specific time periods, or for specific purposes (battles), are required. Another possibility is a selection model where people (soldiers) are selected on the basis of strengths and weaknesses in the context of the expected battle. Other OR models that may be relevant include the application of the principles of a blending problem to ensure the correct mix of soldiers (i.e. proportion of attackers and defenders) or the use of an investment decision model where the choice of regiments has to be made in such a way that the “return” (victory) is as high as possible while the “risk” (defeat and loss of life) is minimised.

Multi-criteria decision analysis seems to be an important application in warfare. Shaka Zulu had to deal with typical multi-criteria decision problems where different criteria need to be considered before engaging in a battle. This is described by Allen as follows: “The role of the environment, particularly the elements comprising of demographics, terrain, weather and disease influenced traditional African warfare”.

Some of the well-known logistics and associated models that may be related to the war activities of Shaka Zulu include transportation, routing, shortest path and scheduling models. The possible application of these types of models may be found in observations by Allen such as “... factors that appeared in varying degrees ... e.g. rudimentary logistics” and “... he provided the means to raise, equip, manoeuvre and sustain a large army”.

Production planning and production mix models may be appropriate as Allen explains that “.... Shaka redesigned the traditional throwing spear .... a short stabbing spear with a long double-edge blade .... Shaka also redesigned the shield, making it bigger and more durable”. All this leads to production decisions such as how to make products (spears and shields) and how many of them should be made.

The warfare example discussed here is only one of multiple possible links between African history and OR applications. Many more examples are relevant and include areas such as trade, social life, housing and medical care. There are also war examples from other tribes such as the Xhosa. The Xhosa fought nine

frontier wars in the Eastern Cape over the period 1779 to 1878 and used tactics such as guerrilla warfare and the choice of narrow battleground where the enemy had to march in single file and could not be assisted by backup forces – OR models may also be applied successfully to these war contexts.

An LP is an LP – but there may be different contexts in which an LP can be explained, illustrated or applied. A few practical pointers to get onto the decolonisation road may include:

- Identifying examples from African history that are similar to Western problem situations and which can typically be solved using mathematical models.
- Ensuring the focus is on decentring Western knowledge, not simply replacing the Western ownership of mathematical sciences with an African discipline.
- Acknowledging that using African examples is just the starting point. The curriculum then needs to be expanded by applying the integration principles of “decolonisation as additive-inclusive knowledge” and “decolonisation as encounters with entangled knowledges”.

The decolonisation of OR (and mathematical sci-

ences) should be treated as a continuous process. It involves dreaming but also laborious research and development.

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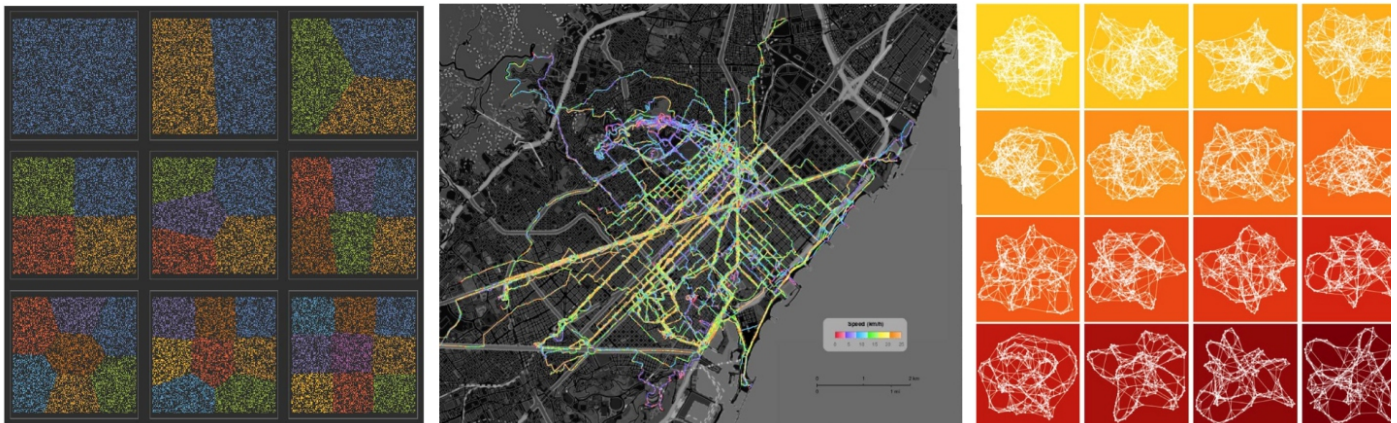
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