Newsletter

Operations Research Society of South Africa
Operasionele Navorsingsvereniging van Suid-Afrika

June 2010

www.orssa.org.za

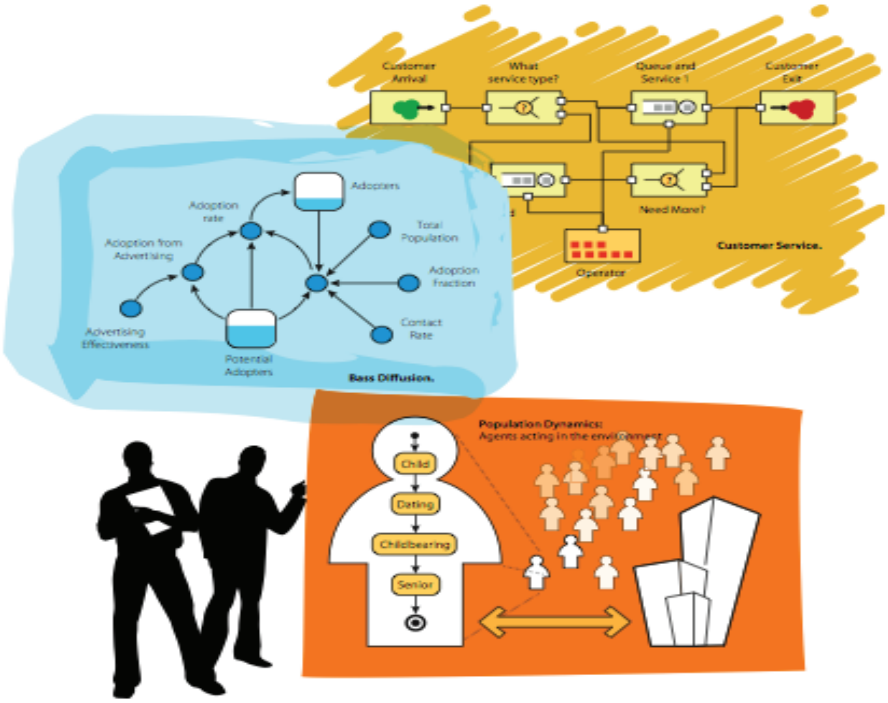
AnyLogic® 6

Multi-Method Simulation Modelling Software

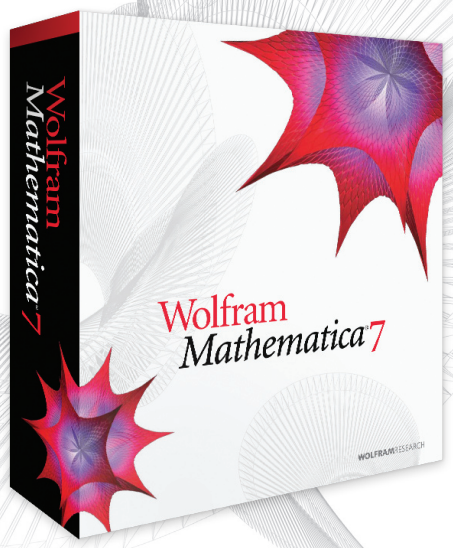
xj technologies

www.xjtek.com

- Asset Management
- Healthcare
- Business Processes
- Manufacturing
- Ecosystem Dynamics
- Logistics
- Traffic and Transportation
- Pedestrian Dynamics
- Social Dynamics



Wolfram Mathematica® 7



COMPUTE DEVELOP DEPLOY

If you're doing anything technical, think *Mathematica*—not just for computation, but for modeling, simulation, visualization, development, documentation, and deployment.

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

New in *Mathematica* 7

Dynamic interactivity ▪ Industrial-strength image processing ▪ Seamless parallel computing ▪ Automated charting graphics ▪ Vector & field visualization ▪ New graphics primitives ▪ Real-time 3D graphics ▪ Dynamic interactivity ▪ Integrated data including genomic, protein, weather, geographic, astronomical, chemical, financial, country, particle, and mathematical data, all available for computation, visualization, and analysis ▪ Unification of graphics, text, and controls

To find out more about what *Mathematica* 7 can do for you, visit **wolfram.com/mathematica**.

FROM THE EDITOR

Contactable at: 14556561@sun.ac.za

Danie Lötter

Welcome to the June edition of the newsletter. First of all I would really like to thank members for their contributions to the newsletter. I also want to make use of this opportunity to urge members to submit more contributions for the newsletter, especially the submission of articles. For the interested readers I have included a number of upcoming conferences. This edition starts off with the letter from the president, Dave Evans, followed by a summary of the 2010 executive committee. An obituary on Cas Troskie from the University of Cape Town is also included. The article featuring in this edition is a case study on decision support for Foodbanking by Esbeth van Dyk form the CSIR, Theo Stewart from the university of Cape Town and Tim Blake from South African Breweries. And last but not least, the member interview is conducted with James Bekker from the University of Stellenbosch. Enjoy☺

DISCLAIMER

Features

QUERIES AND CONTRIBUTIONS

Any queries and contributions to the newsletter are most welcome, especially article submissions. For any queries and contributions, please contact the newsletter editor: Danie Lötter

Email: 14556561@sun.ac.za

IFORS

International Federation of Operational Research Societ

The December 2009 issue of the IFORS News is now available online on the IFORS website *www.ifors.org* For the interested readers, an electronic version is also available in PDF format from the following link: http://www.ifors.org/newsletter/IFORS_DEC09.pdf

FROM THE PRESIDENT'S DESK

by Dave Evans (davee@dbsa.org)
ORSSA President

Dear ORSSA members,

Subscriptions: You should by now have received hard copy statements from our Treasurer, Marthi Harmse, with details of your subscriptions due. If you haven't, we would be extremely grateful if you could let Marthi know so she can resend it: *marthi.harmse@sasol.com* or *kmharmse@mweb.co.za* Likewise, if you would prefer it electronically, please let her know. Our collections of subscriptions fees last year was quite poor. Our postal service is pretty unreliable these days, and it may well be because you did not receive your statement. If that is the case, your statement this year will be for two years' worth of fees. Our apologies for it hitting you like that – please do pay both years' fees. Another possibility is that you did pay last year, electronically, and it came through on our bank statement unidentifiably; we get a couple of those every year. If you did pay last year and your statement doesn't reflect that, please let Marthi know, with the details of when and how.

ORSSA 2010 Conference: Our conference is being hosted this year by the University of Limpopo at the delightful Magoebaskloof Hotel, on the edge of the Highveld escarpment, east of Polokwane, near Tzaneen. (Details elsewhere in this newsletter.) Registration details are also on the website – please get your registration in and papers submitted as soon as possible, and help us make it into another successful ORSSA conference.

ORSSA in Development: The focus on how ORSSA can contribute more to Development in our country is picking up momentum. A group of us had a meeting with one of the country's leading educationalists a few weeks ago. I have also spoken with other people in the health and infrastructure areas and am taking these engagements forward. The idea is for members of the society to contribute to them in the way of a normal business engagement – not in any kind of 'spare time' or 'pro bono' (i.e. free) way. As I said in the last newsletter, please contact me (with absolutely no obligation from your side) if you are interested in looking closer at these activities. The potential for the society, through its members, to make a meaningful contribution to job creation, economic growth and service delivery is significant. To use the same closing line as last time, the need is almost infinite, and there is a great opportunity to use OR in Development, to the overall long term benefit of the whole country – let's make a difference!

NEW ORSSA EXECUTIVE COMMITTEE 2010

President:
Dave Evans

Vice-President:
Sarma Yadavalli

Secretary:
Isabelle Nieuwoudt

Treasurer:
Marthi Harmse

ORiON editor:
Jan van Vuuren

ORiON Business Manager:
Stephan Visagie

Newletter editor:
Danie Lötter

Newsletter Business Manager:
Francois Bester

Webmaster:
Basie Kok

Additional members:

Ozias Ncube	Maseka Lesaoana
Tilla Fick	Ian Durbach

Chapter Chairs:	Johannesburg:	Neil Manson
	Pretoria:	Winnie Pelser
	Vaal Triangle:	Hennie Kruger
	Western Cape:	Margarete Bester

IFORS Representitive: Hans Ittmann

OBITUARY – CAS G TROSKIE

Assembled by Theo Stewart from notes compiled by Christien Thiart and June Juritz

Cas G Troskie

Casparus Gerhardus Troskie was born on 2 October 1936 at Nigel in the old Transvaal. His surname came from a Polish ancestor who had come to South Africa in the 1760's. His first and second name were shared with a very long line of his Troskie forebears, and is now carried by his eldest son.

Cas was of Afrikaner stock. Some of his grandparents had been interred in Boer War concentration camps as young people. He grew up in Springs and was always greatly pleased to report that he had vied for academic honours in all those early years in the same class with one Wieland Gevers, sometime Rhodes Scholar, professor of Medicine and later Deputy Vice Chancellor at UCT.

This story was never told boastfully, but instead it was part of Cas's character to rejoice in the achievements of others, especially his friends and acquaintances, as well as to be grateful for his own.

A youthful Cas entered the University of Pretoria studying Mathematics and Mathematical Statistics as his major subjects. His first degree was a BSc in 1957 and an MSc in 1960. From 1957 he worked at the National Research Institute for Mathematical Sciences of the CSIR, for six years. While employed there, he completed in 1963 a PhD entitled Regression applications of multivariate distributions, through UNISA.

At University of Pretoria he met another outstanding student of mathematical disciplines, Irene Dracht, whom he married in 1962 (in New York). During 1962 using special leave from the CSIR, he and Irene had an extended stay at Columbia University, New York. It was there that he began to build up a substantial set of international contacts. Some of the contacts led to visits in later years by high profile statisticians to the South African universities, and many contacts were important links for his post-graduate students, especially when snail-mail was the only option of communication.

Cas Troskie was appointed as first professor and founding Head of the Department of Mathematical Statistics at UCT in 1966 (when he was not yet 30 years old). He introduced many innovations. Applied work was initially performed with the contemporary mechanical calculators, powered by repeated application of clockwise and anti-clockwise rotations. The hand spun until the ring of a bell signalled the need for a one-place movement of the register to a next digit. But within a few years he moved the Department to the wonders of a large electrical calculator with moving parts, the size of an ancient cash register.

Not long afterwards he found a sponsor for a book-sized desk-top electronic calculator which could perform arithmetic and find a square root, and gave answers on a little screen of tiny lights. Finally he introduced the hand-held HP calculators that could be programmed in a language notation called reversed Polish. He always chuckled at this name.

He chose to direct his PhD's theory of multivariate analysis and associated work on outliers and anomalous observations into applications on the Johannesburg stock exchange. This orientation led him into the theory of time series and econometrics, but also to special expertise about the stock exchange. He supervised 24 MSc and 14 PhD students mainly in these domains, and furthered his expertise during sabbaticals at the University of Gottingen (1980) and Stanford University (1986).

Of particular interest to the OR community is that this (at the time novel) extension into important practical business applications led, inter alia, to establishment of a first comprehensive data base of JSE price movements (initially stored on punch cards and flown to Cape Town), and the development of operations research as a fundamental component of the activities of the then department of mathematical statistics at UCT (now called statistical sciences). As a direct result of these early initiatives in the 1960s and 1970s, the honours programme in statistical sciences at UCT (which includes the BBusSc stream in quantitative management) involves an integration of statistics and operations research, anticipating the modern emphasis on "analytics".

He built up a strong department, bringing in as staff or students many who would make their mark in the statistical and OR communities in South Africa and internationally, including as the years unfolded, June Juritz, Arthur Money, Michael Greenacre, Les Underhill,

John Affleck-Graves, Trevor Hastie, Walter Zucchini and Theo Stewart.

In his later years before retirement he was the Senior Professor at UCT, the longest serving current member of the professoriate. He warned of the calamity that might befall UCT if he were ever called upon to exercise that status under the terms of the University Act.

Professionally, Cas was an active member of the South African Statistical Association and the Operations Research Society of South Africa. He served as SASA President in 1972. In later years he was elected a Fellow of the Association.

In public life, Cas served on the Joint Matriculation Board, and its successor, the SA Certification Council, as statistician from 1972 until the foundation of Umalusi. He also sat on several regional Educational Councils. He was, for many years, a member of the Advisory Panels of the Institute for Biostatistics of the Medical Research Council and the National Research Institute for Mathematical Sciences of the CSIR.

At the 2001 SASA Conference in his year of official retirement, he was asked to come up to the podium. Then his own former post-graduate students present were invited to join him, followed by their post-graduates, and so on, until at the seventh iteration, no further cohorts joined. More than half the conference participants stood with him.

He enjoyed his years as Emeritus Professor and the role and access it gave him to continuing academic work.

Cas was authentically humble, generous of spirit, but nonetheless no stranger to gaiety and enjoyment. He had loved playing rugby but an injury put a stop to its rigours. He embraced the surfboard before and after the age of the large hollow wooden boards, and passed this passion on to his sons. He and Irene engaged the vicissitudes of the little white ball, but he said she was the better player. And he delighted in a party.

Cas suffered from rugby injuries, psoriasis, and also from defective vision for at least three decades. The eye problems gave rise to increasing difficulties and debilitating infections and irritations. After numerous operations he lost the vision in one eye, and towards the end of his life was virtually blind. From a considerable time before his death he could no longer drive a car, and he did not relish this circumstance and its constraints.

These burdens he bore with stolid acceptance. He was acutely conscious of the role Irene had played in making his successes possible. He was a proud father of four sons Casparus, Roelof, Johan and Andre, a delighted grandfather of three boys and four girls. To all his family the UCT community extends its condolences.

The passing of Cas Troskie is also the passing of an era of near 50 years of association with and service to the University of Cape Town. He was a kindly witness and enthusiastic participant in the enormous changes in the institution he deeply loved.

We celebrate a life of a gentle colleague, generous with ideas and open in his disposition to support and encourage whatever talent or excellence came within his sphere of influence.

May he rest in peace.

SP XII 2010 Conference

12th International Conference on Stochastic Programming

The 12th international conference on Stochastic Programming will take place August 16-20, 2010 in Halifax, Nova Scotia. The conference aims to bring together the leading researchers in stochastic programming, practitioners in the field, students and users. For full details on the conference please visit the conference webpage on http://icsp12.dal.ca/

IFORS 2011

Conference for the International Federation of Operational Research Societies

The 19th Triennial Conference of the International Federation of Operational Research Societies (IFORS) which will be hosted by the Victorian chapter of the Australian Society for Operations Research (ASOR). The conference will be held at the new Melbourne Convention Centre in the centre of the city of Melbourne, Australia from the 10th to the 15th July 2011 and will bring operational researchers from around the globe together. Deadline for paper submissions is 15 December 2010. For full details on the conference please visit the conference webpage on www.ifors2011.org.

Insurance industry soul-searching for better risk management

The financial repercussions of the global economic downturn and weary market sentiment continue to be felt throughout South Africa, specifically in the insurance industry.

Here risk remains high, in the midst of a drive in the market to create greater transparency, efficiency and improved performance.

The insurance industry, in particular, despite the efforts from banks and regulatory bodies, is very aware of what impact the global recession is having on South Africa's financial markets. It is no wonder that the way in which they identify, assess and manage these risks continue to remain under the spotlight.

This is according to André Zitzke, Head of Risk Practice at SAS South Africa, who says that the recession has revealed the defects of a whole host of risk mitigation issues, and major soul-searching is now underway to ensure that the risk and controls functions in insurance institutions will be more robust, authoritative and accountable in future.

"Regulatory bodies are increasingly eyeing the consequences of managed approaches to curb risk more pragmatically. The Financial Services Board (FSB) is progressing with its implementation of the new Solvency Assessment and Management (SAM) regime in 2010, which means that addressing issues such as data management, its data quality, analytics and reporting capabilities is becoming paramount," he says.

The SAM system is being introduced to address particular concerns related to governance, internal controls and risk management in both the long-term and short-term insurance sectors. The SAM system is similar to Basel II guidelines in the banking services industry, which provides a regulatory framework to promote the soundness of insurance companies through the effective application of international regulatory and supervisory standards.

Zitzke says, as a result of the volatile industry riding the repercussions of the recession and pending legislations that would provide additional stress on existing and new staff, the global insurance industry shows a trend of investing much more on getting accurate and reliable data to support their risk functions.

To make this investment more cost effective, Zitzke says SAS has introduced SAS Risk Management for Insurance, a solution that addresses enterprise risk management in the insurance industry comprising the three major requirements in the industry today. The solution includes an insurance-specific data model and framework that assists life and P&C insurance companies to implement the global Solvency II standard model and the therefore the local SAM regime for calculating risk-based capital cost-effectively.

"This allows insurers to more effectively manage risk, give organisations an industry standard data foundation, comprehensive analytics and an industry leading reporting platform," he adds. "With a robust risk management software solution, insurers can perform more accurate analysis, employing an enterprise risk repository that offers more comprehensive data management that results in better risk-based business decisions, and importantly, reduces the total cost of ownership."

The insurance industry, in particular, despite the efforts from banks and regulatory bodies, is very aware of what impact the global recession is having on South Africa's financial markets.

Additionally, a single solution that can integrate seamlessly with current risk software investments, dramatically decreases the "cost to company" aspect of IT software solutions.

The next version of the framework also enables insurers to support the internal model approach for risk analysis, which provides another added benefit – providing senior management with a greater understanding of the company's risk and financial condition," he adds.

André Zitzke, Head of Risk Practice
SAS South Africa

Stress testing, in particular, says Zitzke, forms an integral part of the risk management portfolio, which tests an insurer's assets and liabilities against the sudden, volatile changes in economic market conditions. New exciting developments at SAS will make this exercise less stressful for financial institutions.

Across the industry, risk management has moved to the centre of strategic decision making, and many institutions are revamping their entire approach to understanding and mitigating the risks that they face. In fact, risk management, is not just a function of an insurer, it is the insurer," he concludes.

To learn more about how to meet the requirements for real-time decision making, contact SAS on +27 11 713 3400 (Johannesburg and Pretoria) or +27 21 912 2420 (Cape Town) or visit our website www.sas.com/sa

Decision support for Foodbanking: A Case Study

by Esbeth van Dyk†, Theo Stewart and Tim Blake°*
†CSIR Built environment, Stellenbosch
***Department of Statistical Science, University of Cape Town**
°South African Breweries, Sandown

1. Introduction

The first foodbank in Sub-Saharan Africa opened its doors in Cape Town in March 2009. In brief a foodbank sources donated food from manufacturers, wholesalers, retailers, and others and then redistributes it to social service organisations ("agencies") such as soup kitchens, nutrition centres, disadvantaged schools, orphanages, old age homes and HIV/Aids clinics, who in turn provide meals to underprivileged and vulnerable individuals [Foodbank South Africa].

Although South Africa is one of only a handful of countries capable of providing enough food for its inhabitants, it is estimated that 40% of its population, amounting to over 19 million people, are food insecure due to poverty. Early in 2008 the South African Forum for Food Security, consisting of 38 organisations, was formed with assistance of the Global Foodbanking Network (GFN), based in the USA, to address the uncoordinated approach to hunger relief. The GFN's mission is to "work collaboratively to alleviate world hunger by developing national networks of foodbanks and strengthening foodbanking around the world". It does this by helping foodbanks that already exist in countries outside the USA and by working to create new ones where they are needed. The GFN draws on more than 40 years of foodbanking experience in the USA and currently operates in 14 countries. As of January 2009, America's Second Harvest (the USA foodbanking network) distributes more than 900 000 tons of donated food and grocery product annually to more than 25 million hungry people in the United States [Global Foodbanking Network].

Towards the end of 2008 Foodbank South Africa (FBSA) was formed by amalgamating, amongst others, the resources of Feedback Food Redistribution, Lions Food Project and the Robin Good Initiative. This was done after extensive consultation with hundreds of organisations to investigate how South Africa's food resources could be used more effectively to feed the hungry. The aim of FBSA is to establish a network of community foodbanks in urban and rural areas throughout South Africa in order to reduce hunger and food insecurity [Foodbank South Africa].

FBSA can negotiate at a high level with the food industry (food producers, manufacturers, wholesalers and retailers), government and donor funding organisations in order to secure donations of food and money. Given the socio-economic conditions in South Africa, the amount of food needed to feed those living in poverty, is expected to be more than the amount of food donated to the foodbank. Also, it is unlikely that the donated food will constitute the whole range of products required for providing nutritious meals. Therefore either the foodbank or the agencies will have to buy in certain products to supplement the donations. Again, FBSA can negotiate discounted prices for food purchases, thereby ensuring economies of scale for the agencies that it serves.

2. Problem description

The Cape Town Foodbank Forum (CTFBF) was established towards the end of 2007 as a working group of interested and affected parties with the aim to plan and establish a foodbank in Cape Town, now known as Foodbank Cape Town (FBCT). Decision support was required in three broad areas, namely:

1. Problem structuring and project management, for example, which tasks need to be performed in setting up a foodbank, in which order and by what times;
2. Selection of a suitable warehouse in terms of size, location and facilities offered;

3. Allocation of food to agencies, for example, which agencies qualify for support and how much food should they receive.

This project was executed by Tim Blake for his Masters studies in OR for Development at UCT, under supervision of Prof Theo Stewart (Department of Statistical Sciences, UCT) and Dr Esbeth van Dyk (CSIR Built Environment). This article briefly describes the allocation of food to agencies.

3. Allocation of food resources

A typical foodbank would operate as follows:

1. Food that would otherwise go to waste is donated by producers, manufacturers, wholesalers, retailers, the catering industry, etc. to the foodbank. Reasons for food donations include labelling errors, food near expiration date, brand discontinuation, inventory surplus, minor recipe variation, damaged packaging, etc. Food could also be bought to supplement donations.
2. The foodbank may collect the donated food from the donors using their own or rented trucks, bringing it back to its warehouse, or donors may on occasion deliver the food to the warehouse.
3. The details of the donation are captured and then the food is sorted, cleaned and the brand defaced to protect the donors. The food is stored in hygienic conditions, using refrigeration where required and ensuring quality control.
4. The foodbank makes up nutritional food packages (as far as possible), which it either delivers to the agencies (social service organisations) directly or to a depot from where the agencies collect their food parcels.
5. Agencies in turn supply the food parcels or meals to their beneficiaries through various programmes such as soup kitchens, school feeding programmes, abuse clinics, etc.

Unfortunately, in South Africa, the demand for food from the foodbank will always far out-strip the supply. The aim of this research was therefore to create a model to assist FBCT with allocating food resources to potential recipient agencies such that humanitarian benefit is maximized. Due to the ill-defined nature of the problem, a series of workshops were facilitated for FBCT representatives in order to structure the problem and build the model while creating ownership for the participants. The workshop participants held prominent positions in organisations with feeding programmes. This meant that they:

- understood both what foodbanking was about as well as the need for an allocation model;
- had valuable “on-the-ground" experience of feeding and developing underprivileged people;
- had an understanding of the South African NGO context and the kinds of agencies the foodbank would most like to support; and
- came from a diverse range of organizations, which would result in different viewpoints and therefore insightful discussion.

The group also included the individuals who would have to implement the model.

4. Developing a scoring system for agencies

The specific MCDM methodology used for scoring was Multi-Attribute Value Theory (MAVT), which develops scores as a weighted sum of values for criteria (i.e. the score for an agency *i* can be denoted by $S_i = \sum_k w_k u_k(i)$ where w_k is the weight of criterion *k* denoting its relative importance, and $u_k(i)$ is the value score of agency *i* in terms of criterion *k*). The criteria, their value scores and their associated weights were developed by facilitating a series of five 3-hour workshops. In between these workshops there was back-room analysis as well as occasional extra questions/work for the participants **[**Blake, 2010].

The first three workshops were used to develop criteria and define the particular scenarios that could be realized under these criteria. The acronym “CAUSE" (criteria, alternatives, uncertainty, stakeholders and environment) [Belton and Stewart, 2002] was used as it provides a framework for structuring problems in an MCDM context. The following question was displayed as a starting point for generating ideas.

What are the important factors to be considered when deciding:

- To which agencies to give food;
- How much food to give; and

- What type of food to give?"

Once the main criteria had been established, participants were asked to write a short description of what the best imaginable scenario for a particular criterion would look like; what the worst imaginable scenario would look like; as well as two or three intermediate scenarios. After the initial round of defining main and sub criteria, participants were able to openly debate the validity of certain criteria and refine what was originally put forward.

Each end-level criterion (defined as a criterion with no sub criteria) required a scoring system for its scenarios and a weight that would specify its relative importance to other end-level criteria. Two workshops were conducted for this part of the process. The best-case scenario under a certain criterion would receive a score of 100 while the worst-case scenario would receive a score of 0 (best-case being the most deserving of food support). Figure 1 shows a value tree of the final criteria. There are two main criteria: “Demographics", which refers to certain attributes of the agency's beneficiaries; and “Operation and Management of the Organization", which attempts to measure the level of service the agency provides. Table 1 shows the resultant weights on end-level criteria and the respective scores for different scenarios under criteria.

5. Future work

The model that has been developed can be used to decide which agencies should qualify for support from the Foodbank. Agencies that are currently supported by the Foodbank are being scored according to this new model. If they do not score well they will be given a transition period of a year during which they can improve their operations in order to increase their score. Once the Foodbank has a sufficient supply of food to take on additional agencies, new applicants will also be screened by using this model.

An additional model is required to determine the quantity and mix of food from the available supply that should be provided to each agency. This topic is being incorporated into a new Masters project in OR for Development at UCT, under supervision of Prof Theo Stewart.

Since the Foodbank is still in a developmental stage it needs support to develop a cost-efficient operational strategy, which includes aspects such as the fleet composition and the number and location of depots. This is being undertaken by a Masters student in Operations Research at the Department of Logistics, Stellenbosch University, under supervision of Prof Jan van Vuuren (Head of Operations Research, Stellenbosch University) and Dr Esbeth van Dyk (CSIR Built Environment).

6. References

- *Belton, V. and Stewart, T.J. 2002. Multiple Criteria Decision Analysis: An Integrated Approach (2nd ed). Kluwer Academic Publishers. Dordrecht, The Netherlands*.
- *Blake, T.J. 2010. Aiding Decision Making for Foodbank Cape Town. MSc Thesis, University of Cape Town.*
- *Foodbank South Africa. http://www.foodbank.org.za/*
- *Global Foodbanking Network. http://www.foodbank.org/*

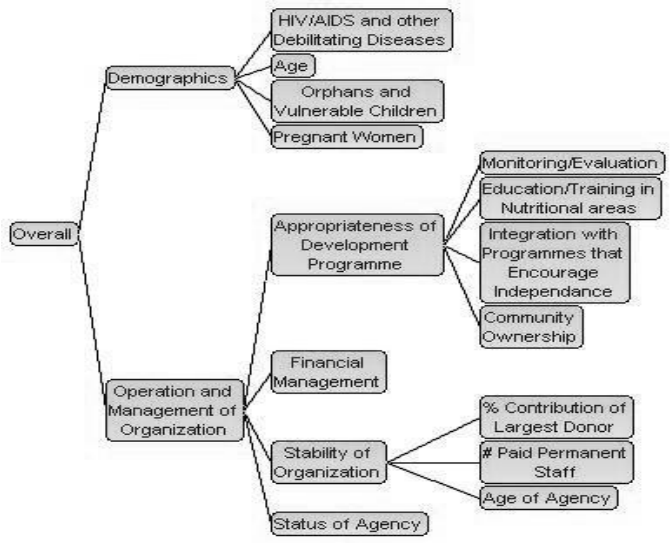


Figure 1: Criteria used to develop a score for agencies (Source: Blake, 2010)

End-level Criterion	Weight	Scenario	Score
HIV/Aids and other debilitating diseases	100	Yes No	100 0
Age	100	Yes No	100 0
Orphans and vulnerable children	60	Yes	100
Pregnant women	60	Yes No	100 0
Monitoring / Evaluation	30	Yes No	100 0
Education / Training in nutritional areas	30	Yes No	100 0
Integration with programmes that encourage independence	80	Yes No	100 0
Community ownership	30	Average above 50% Average below 50%	100 0
Financial management	80	3 indicators satisfied 2 indicators satisfied 1 indicator satisfied 0 indicators satisfied	100 75 25 0
% Contribution of largest donor	35	Under 50 50 to 75 Over 75	100 75 0
# of paid permanent staff	35	More than 8 4 to 8 Fewer than 4	100 75 0
Age of agency (years)	35	Over 5 2 to 5 Under 2	100 75 0
Status of agency	60	Valid NPO and PBO NPO only Not registered	100 75 0

Table 1: Table showing all end-level criteria with their respective weights and scenarios with scores (Source: Blake, 2010)

MATIES TAKES ON IKEYS IN OR

by Margarete Bester (mbester@oprecon.com)

This year two honours projects of 2009 were entered into the WC student competition. The objectives of the competition are:

- to propagate the use of Operations Research (OR)
- to encourage the inclusion of project work in courses within the field of OR
- to bring the Operations Research Society of South Africa (ORSSA) to the attention of students and staff at universities and technikons.

The competition was held on the 10th of March 2010 at the University of Stellenbosch Business school. There were approximately 15 attendees, mainly student supporters.

Robert Roxin, a student from the University of Cape Town gave an excellent talk on Resource Constrained Project Scheduling. He presented a decision support system generally designed to solve this problem. I was very impressed with his talk, but also with the fact that he decided to take on a project trying to optimally solve a problem historically shown to only be solvable heuristically within a realistic timeframe. Unfortunately,

although computers have evolved a lot in the last couple of years, the problem could still not be solved optimally within a realistic timeframe.

Jason Matthews, from the University of Stellenbosch, presented his project titled: “Single fixed crane optimisation within a distribution centre”. He gave an excellent talk, his project focussing on a case study conducted at PEP. He used meta heuristics to solve a crane scheduling problem. This was a very nice practical project and showed true benefit to the SA industry.

In the end Jason Matthews, walked away with the prize money of R500 sponsored by OpRecon.

Figure 1: Jason Matthews and Margarete Bester

ORSSA Conference 2010

39th Annual conference of the Operations Research Society of South Africa

Hosted by: University of Limpopo
Venue: Magoebaskloof Hotel
Dates: 26 -29 September 2010

www.orssaconf.co.za

Keynote Speaker: Professor James Cochran
Louisiana Technical University
Los Angeles
USA

Online Registration opened on Monday 10th of May 2010.
Please take note of the following important dates:

Friday 30 July 2010:	Deadline for Abstract Submissions
Monday 12 July 2010:	Deadline for Early-bird Registration
Monday 23 August 2010:	Notification of Acceptance
Friday 17 September 2010:	Last day of Registration
Sunday 26 September 2010:	Welcome Reception
Monday 27 September 2010:	Start of Conference

Registration and abstract submissions may be done online on the conference website.

MEMBER INTERVIEW: JAMES BEKKER

Contactable at: jb2@sun.ac.za

James Bekker

James Bekker finished school in Bloemfontein and obtained a first degree in mechanical engineering at Stellenbosch University. He followed it up doing a Master's degree in industrial engineering with a thesis on robot vision. During his compulsory service in the former National Defence Force he got so bored that he enrolled for a Diploma in Datametrics at Unisa – he simply could not get away from the exciting woes of assembler programming he encountered while doing his thesis. Today he is still thinking in bits. He loves not watching rugby, reading (Afrikaans literature, SA history, science, Gary Larson cartoons) and often attempts a few DIY projects at home. His argument in favour of the latter is "rather mess it up yourself than paying someone to do the same". He was the All Africa Wheelbarrow Wheelie Champion in 1996.

When and how did you first become involved in OR and ORSSA?

I followed courses in Linear Programming and Integer Programming while doing Master's. At that time these were compulsary subjects for Master's students in the Department of Industrial Engineering at SU, and I had the privilege to study under Prof. Marius Sinclair. I did courses in Manipulator Mechanics which were presented by the legendary Mr Johan Uys of the Department of Applied Mathematics at SU, and also tried a course in computer simulation. All these made me realise that the idea of applying mathematical techniques to solve real-world problems is challenging and rewarding, so the interest had been conceived. It was around 2000 that Dr Esbeth van Dyk of the CSIR introduced me to ORSSA. She showed me an optimisation result which proved that for an almost zero subscription fee to ORSSA one gets an infinite return, and I couldn't resist, so I joined the Society.

You are an industrial engineer. How are industrial engineering and operations research related, and how do they differ?

I think all disciplines of engineering are related to OR, since engineers in the end try to optimise and improve. Industrial engineers only realised that formally, and buy into the power offered by OR. I am displeased that advanced OR is not presented anymore to post-graduate students in industrial engineering (at least in my department), but fortunately it is still part of the undergraduate course.

Sometimes engineers are forced to bend the underlying assumptions of OR theory when solving a problem, so we are DORPs – Dirty OR Practitioners. It is thus good to attend OR conferences and to read OR journals just to get recalibrated by the purists.

You are considered a national expert in simulation. What kind of problems are ideally suited to simulation, and what kind of problems are not?

I think the readers may have different perceptions and understanding of simulation, so let me define my simulation domain first: I mainly work in the sub-domain where one imitates a real-world process on a computer to evaluate different scenarios. I therefore do not simulate problems, but processes having latent problems or a potential for improvement through process changes. It could be the process of a pilot ejecting from a jet, the heat transfer process in a given medium or the flow of documents in a business. There are of course many other non-process related forms of simulation of which the Monte-Carlo technique is perhaps best-known. Traditionally, problem-solvers revert to simulation when a problem (as part of a process or not) does not fit a known analytical technique, or is too large to translate to some solution frame. I believe that one should always follow the analytical route if possible, because it is proven and clean. However, simulation is a good technique to apply when a problem cannot be isolated from its surrounding dynamic, stochastic and complex processes.

Simulation is also used to support decision-making in real time, so one has a model of for example the processes on a factory floor, and a simulation can "run ahead" and predict possible problems. Simulation can also be used to do real time planning – a student and I

are working on a system that does rescheduling on demand in a job shop, and the concept has already been established by a former student.

You have recently embarked on PhD studies. Can you tell us more about your topic?

I am interested in establishing decision-support in discrete, multi-objective stochastic processes of which the objectives are non-commensurable. The objectives are evaluated using computer simulation, and since evaluation can be computationally expensive, I am attempting to propose a heuristic that will minimise the number of evaluations while solution combinations approach the true Pareto front.

What have been the highlights of your OR career?

I worked on many industrial projects giving advice on simulation practice, and I enjoyed the diversity very much. I was involved in a steel factory, an apple packhouse, train shunting operations, reliability assessment in a chemical processing plant, our fruit export supply chain, hospital process improvement and traffic junctions, to name some of many. I often remind myself that I am applying principles and techniques of Statistics, Mathematics and Computer Programming when doing simulation work, and that is a continuous highlight that keeps me smiling.
The annual ORSSA Conferences are always enjoyable and refreshing, and the people I have met in the OR community are of the finest fibre. Yes, and I must mention that being introduced to Latex by Neil Jacobs remains a highlight.

Have you recently been involved in any interesting OR related projects?

I supervised a student who studied a section of the traffic flow in Stellenbosch in fulfillment of her final year project. We obtained real-world data from the local Traffic Department and determined time durations of the traffic lights (red and green) at the different junctions to increase the number of vehicles passing through the section. We used computer simulation to imitate the flow of the vehicles, and we could suggest different time durations that result in improvement, or so we predicted. The results of course only apply to the day of the week for which the data was provided, but we demonstrated the principle.

Currently I am involved in a project suggesting an approach for capacity planning of bus stations in Cape Town. This is for the new bus rapid transfer (BRT) system that will be introduced in the near future.

What do you think the future holds for OR in South Africa?

I understand that the SA Government tries to promote science and mathematics at school level. There are still too few well-educated learners in these fields, while OR needs them to study on tertiary level. If those involved with education can establish a quality supply chain of young math-oriented South Africans (Grade 1 to post-graduate level), then OR educators on tertiary level can draw from that pool and the present and the future will be bright. We have plenty of challenging problems in South Africa and Africa that beg for OR solutions, for which a large number of well-qualified people are required. I also believe that OR practitioners (in general) are very bad, I mean spectacularly useless, when trying to sell results and findings of studies to the often emotionally-driven decision-makers. That is something we have to address, otherwise we shall remain just another discipline of study and research in the future.

Do you have an inspiring message for young and aspiring operations researchers?

To school learners I say: If you look for a challenging and rewarding career with diverse career opportunities, look no further. For students in the field I shall tell what I often say to myself: 1) Don't take the problem too seriously. 2) First try and understand what happens, then how it happens. 3) Avoid getting mired in detail.
If you want to go and work overseas, please go, but please come back soon.

ICOR 2010 : "International Conference on Operations Research"

The International Conference on Operations Research aims to bring together academic scientists, leading engineers, industry researchers and scholar students to exchange and share their experiences and research results about all aspects of Operations Research, and discuss the practical challenges encountered and the solutions adopted. The conference will take place in Venice, Italy from November 24-26, 2010. The interested reader is referred to the conference webpage for important dates and further information, *http://www.waset.org/conferences/2010/venice/icor/index.php*

Reinforce your optimization with AIMMS uncertainty modeling

www.aimms.com

AIMMS® THE MODELING SYSTEM 3

Dealing with uncertainty

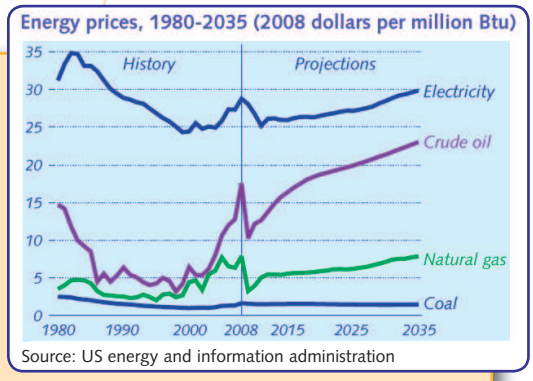
AIMMS offers three ways to incorporate uncertainty (e.g. development of the energy price) into your model. Depending on your industry or application, one way might be more suitable than the other, but all integrate the reality of uncertainty in your business. Even better, all will improve your decision-making and therefore improve your results.

"The Robust Optimization extension in AIMMS is very natural and intuitive and will enable optimization specialists to solve realistic large-scale linear optimization problems affected by uncertainty without imposing on the end-users the need to provide full information on the nature of the uncertainty."

Professor Aharon Ben-Tal
Technion, Developer of the Robust Optimization Methodology

SCENARIO ANALYSIS

A straightforward approach used in many industries for strategic studies, risk assessments etc. Users can compare scenarios, do experiments, or run Monte Carlo simulations to analyze model behavior by varying input data such as energy demand, energy price, etc. and base decisions on individual or aggregated results.



Source: US energy and information administration

STOCHASTIC PROGRAMMING

Considers all the expected scenarios at once and makes a trade-off by optimizing the expected result using scenario probability. The solution found will be feasible for all scenarios.

ROBUST OPTIMIZATION **NEW**

Considers data uncertainties against whose realizations the solution is required to remain feasible. This uncertainty may occur in any part of the model data. Partial feasibility can be included by adding probabilities to constraints (e.g. the chance that demand is met is at least 95%).

We can help

Including uncertainty into your decision making process is not necessarily easy, but we can help you. Contact us and learn more about uncertainty modeling in your business using AIMMS, or visit www.aimms.com/uncertaintymodeling.

A free trial of AIMMS, including all uncertainty features: www.aimms.com/trial.

PARAGON Decision Technology

Europe, Middle East & Africa • Haarlem, The Netherlands • Phone: +31 (23) 5511 512
Americas • Kirkland, WA, USA • Phone: +1 (425) 576 4060
Asia Pacific • Singapore • Phone: +65 9640 4182
www.aimms.com • info@aimms.com