Operations Research Society of South Africa

At the Forefront of Analytics in Africa

ORSSA Newsletter December 2014

www.orssa.org.za

44th ORSSA Annual Conference
13–16 September 2015

An advanced warm welcome to the 44th Annual Conference of the Operations Research Society of South Africa (ORSSA). The conference will be hosted by the Johannesburg Chapter of ORSSA, and held at Pecan Manor in the Hartbeespoort valley from 13-16 September 2015.

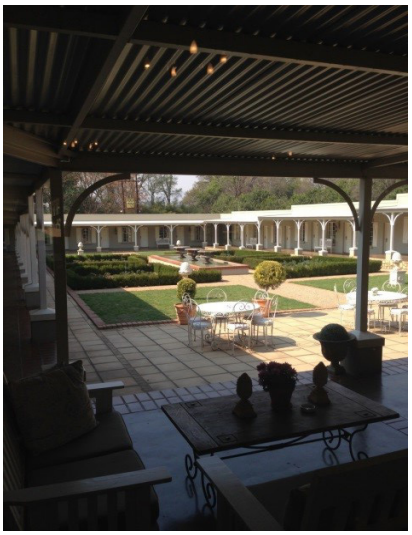
The conference will open with an optional tutorial on Sunday afternoon and a welcome reception on Sunday evening, September 13th and will close at lunchtime on Wednesday, September 16th. Participation over the full spectrum of Operations Research is encouraged, including papers of a more fundamental nature, those on the application of Operations Research techniques in business and industry, about topical issues in Operations Research, and about the philosophy, teaching and marketing of Operations Research.

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

Following the successful introduction of published conference proceedings in 2011, authors will again have the choice of either (a) only presenting papers orally at the conference, or (b) submitting full papers (which will also be presented orally at the conference) for inclusion in the peer-reviewed conference proceedings. Registration, and submissions of abstracts and full papers will open during the first quarter of 2015.

Delegates are responsible for their own travel and accommodation arrangements. Pecan Manor and her sister lodge Green Leaves are recommended, as the Society has arranged competitive rates for delegate at these venues.

Pecan Manor – http://www.pecanmanor.co.za/
Green Leaves – http://www.greenleaves.co.za/



Peacon Manor

Important Dates

16 March 2015	Early bird registration & abstract/paper submission opens
10 April 2015	Abstract submission closes for reviewed papers
17 April 2015	Notification of acceptance of abstracts of reviewed papers and go-ahead to submit full papers for peer-review
15 May 2015	Submission of full papers for inclusion in the conference proceedings closes
10 July 2015	Abstract submission closes for oral presentation of all papers
17 July 2015	Notification of abstract acceptance for non-reviewed papers
17 July 2015	Notification of acceptance of reviewed papers for proceedings
24 July 2015	Early bird registration closes
14 August 2015	Cut-off for qualification of reduced room rates at the hotel
21 August 2015	Registration closes

Please visit the ORSSA website and click on the link *ORSSA 2015* for more information:
www.orssa.org.za

From The Editor

By Mark Einhorn (einhorn@sun.ac.za)
Stellenbosch University
ORSSA Newsletter Editor


Mark Einhorn

Hello and welcome to our final Newsletter for 2014, and what happens to be the final edition of the ORSSA Newsletter of which I am the editor. As of next year, I shall be passing the proverbial torch into the very capable hands of Bernie Lindner, and I am certain that he will maintain the high standards of this publication. In fact, I would like to thank Bernie for all of his help in putting together this edition.

For my final word as editor, I would like to address the student members of ORSSA, and share with them how much I have gained over the past six years from my involvement with operations research and, in particular, ORSSA. I have been a student member of ORSSA for six years now, and in that time I have been afforded the opportunity to attend and present my work at six National ORSSA Conferences, all at beautiful locations around South Africa. In fact, my involvement with operations research even led me as far afield as the IFORS conference in Barcelona earlier this year. At each of these conferences, I have met and conversed with some of the legends of operations research in South Africa and have received invaluable feedback and advice with respect to my research. This is in addition to the friendships that have been made and the many drinks and jokes that have been shared, as is customary at any ORSSA conference. Yes, ORSSA has already opened many doors for me, but perhaps the most important of these doors was opened in the past few months. I have recently been employed as an optimisation consultant and analyst. I can confidently say that this appointment was directly influenced by my involvement with ORSSA and my partaking in presenting my research at this year's ORSSA conference. Mine is not the only success story, however, and I guess what I am trying to get across to you student members, is that there is potential and opportunity associated with being a member of ORSSA. Also, I have come to find that the more you put into ORSSA, the more you will get out of ORSSA.

As of next year, I will be the marketing manager of ORSSA, and my main objective is to make industry aware of the potential of operations research, and in doing so, creating opportunities for our members, both full and student, in the work place to showcase operations research and ORSSA.

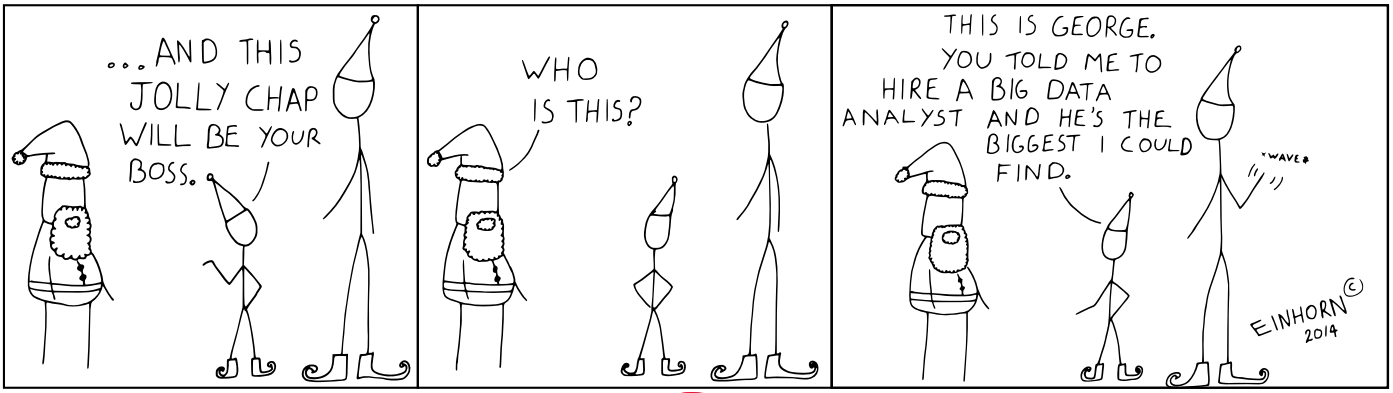
Thank you all for reading over the past three years, and for one last time, cheers all, and enjoy the read!

P.S. I'll still be drawing the comics ;).

Features Page

QUERIES & CONTRIBUTIONS

Any queries or contributions to the Newsletter are most welcome, especially article submissions. For any queries or contributions, please contact the Newsletter editor at *berndtlindner@gmail.com*.



From The President's Desk

By Hennie Kruger
North-West University
(Hennie.Kruger@nwu.ac.za)
ORSSA President


Hennie Kruger

It is almost unbelievable how quickly time passes. By the time you read this edition of the newsletter many of you will already be enjoying a well-deserved year-end rest period. Welcome to the final newsletter for this year – in this final message I want to reflect very briefly on some of the activities of ORSSA during 2014.

Our chapters have been active this year and I am pleased to report that a number of activities took place during the year. Most chapters have already had their AGMs and new executive committees for the respective chapters have been elected. I would like to thank the outgoing chapter executive members for their hard work and for the regular events organized during 2014. Welcome to the new and incoming chapter executive members – we are looking forward to a busy and interesting 2015 for all the chapters.

One of the highlights on the ORSSA calendar is the annual conference which took place in September this year. The conference was held at Stonehenge and was a successful and truly enjoyable event. A large variety of papers were presented and a significant number of delegates (including students and industry participants) attended the conference. The conference was also an opportunity to celebrate the achievements of our members and the Tom Rozwadowski medal and other recognition awards were once again awarded to our members.

This year has also seen a number of new initiatives that are either being implemented or still being investigated. Some of the initiatives include:

- ORSSA has embarked on an awareness campaign to make our members aware of the new Certified Analytics Professional (CAP) qualification which was launched by INFORMS in 2013. Information on this was presented in our Newsletters as well as at the annual conference.
- Meetup groups were successfully established in the Pretoria, Johannesburg and Western Cape regions. Regular meetings are held which serve as a forum to people involved in operations research to make contact with others who share a common passion for operations research and the fields in which they work. Should anyone need further information on these meetup groups, or would like to join the meetings, please contact Angela Rademeyer at Angela.Rademeyer@gmail.com
- At the AGM in September a change in the Constitution of ORSSA was approved. This change will ensure that the accounting records of the society will be prepared by an independent and professional accountant, appointed by the Executive committee. Furthermore, the accounting records will be prepared in accordance with Article 17 of the Non-profit Organisations Act of 1997. The Executive committee is currently investigating the registration of the Society as a Non-profit Organisation which is a requirement for preparing accounting records according to the mentioned act.
- The Society is also investigating the possibility of obtaining a BEE certificate. This may assist in making our annual conference and other events more attractive to attend, especially for our colleagues from industry.
- At the beginning of 2014 ORSSA's bank account was moved to Standard Bank. This move was primarily based on service considerations and will enable us to further streamline our financial activities. Please ensure that all payments are made into the new Standard Bank account – banking details will appear on all invoices but if there is a need for further details, the treasurer can be contacted at Tiny.duToit@nwu.ac.za

We are continuing the process of terminating memberships of people with whom we had lost contact over the years or who have fallen behind significantly in terms of paying membership dues. This is not a pleasant task and I would like to urge all members to remain active members of our Society, not just by attending events but also by making timely payments of membership fees.

A few members of the national Executive committee will be stepping down at the end of 2014. They are Tanya Visser (Secretary), Ian Durbach (Database Administrator), Dave Evans (Marketing Manager), Niel Matthee (Webmaster), Elias Munapoe (Additional member) and Elias Willemse (Additional member). To all these members my sincere thanks for your superb service to the Society over the years. Newly elected members of the Executive committee include Louzanne Oosthuizen, Linke Potgieter, Jacques du Plessis and Bernie Lindner. Welcome to you all and thank you for your willingness to serve on the Executive committee. In the next Newsletter I will report on the portfolios that were allocated to the new members as well as on current members who will be moving to new portfolios.

Jan van Vuuren has completed his four year cycle as president of ORSSA (president during 2012 and 2013 and vice president during 2011 and 2014). I would like to say a special thank you to Jan for his services during his presidential

cycle. In particular for this year where I had to rely a lot on his advice, second opinions and support – thanks Jan, I really appreciate your help. Fortunately, Jan is not leaving the Executive committee and will stay on as an additional member.

I think it is fair to say that 2014 has been a good year for ORSSA. I am convinced that we as a Society have identified "four minute mile" opportunities (I referred to them in the March 2014 Newsletter) and that we were able to convert most of them into new achievements. I would therefore like to thank each and every member of the Society, the national Executive committee, our sponsors, chapter committees and every other colleague for helping to realize our activities and achievements and for making 2014 a successful year for ORSSA.

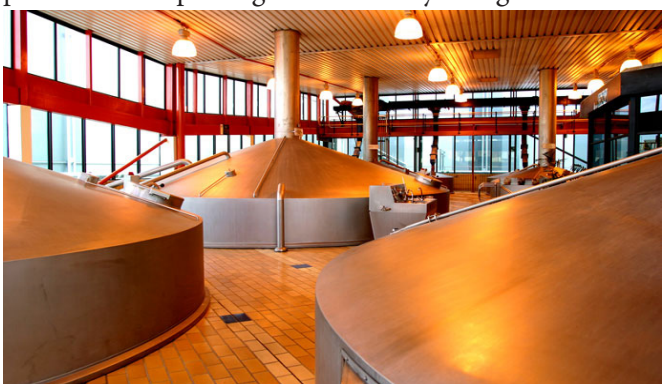
Finally, all that remains is to wish you all a prosperous festive season. I trust that everybody will have a peaceful and enjoyable period of rest before we take on the new challenges of 2015.

All the best / Alles van die beste
Hennie Kruger

Western Cape Chapter Event

by Berndt Lindner (berndtlindner@gmail.com), Stellenbosch University

On Friday the 26th of September 2014, the Western Cape chapter had the privilege of visiting the South African Breweries' (SAB) Newlands brewery. The event was attended by 25 individuals, most of them being undergrad Industrial Engineering students.



SAB Newlands brewing tanks.

We were firstly treated to an insightful presentation by SAB Newland's Operations Manager on SAB and its some of its operations.
Some interesting facts shared on the tour and availalble on wikipedia include:

- SABMiller is the world's second largest brewer measured by revenues, after Ancheuser-busch InBev (Beglian-Brazilian),
- It operates in 75 countires across Africa, Asia, Australia, Europe, North America and South America,
- It sells around 21 billion litres of lager per year,
- It has 7 Breweries in South Africa (Newlands 4th largest),
- It has 40 Depots in South Africa,
- It has an annual brewing capacity of 3.1 billion litres.

Recently it has been reported that SABMiller and Coca-Cola plan to merge forces under the name of Coca-Cola Beverages, which will make them one of the world's largest bottling operations.

But apart from the interesting facts shared, we were treated to a tour of the brewery and educated about its interesting history and given an overview of the different operations, from brewing to bottling. This includes receiving around 2 million returned quarts bottles a day (75% of production), to being labelled (capacity of 833 bottles a minute). SAB Newlands has to move an average of 100 trucks a day (average stock of 2-3 days) in the tight Newlands suburb.

Members given a history of SA Breweries before the site tour.

With all this there are naturally many scheduling and logistical challenges. SAB does use SAP enterprise software to capture all the operations data. They also use the Supply Chain Operations Reference (SCOR) model along its supply chain with a simple objective of "keeping the fridges full", and I can confirm they are accomplishing that at my local hangouts. Specific techniques which they use to solve these problems were not made clear, but I am sure there are many OR techniques which they use.

Finally, and one of the highlights was that we were treated to a beer tasting with five vastly different beers (from castle lite lime to milk stout). With more beer, including two free beers, from the local and "lekker" bar with the widest variety of SAB beers on tap. I would really like to thank Danie Lotter for organising the tour - it really was enjoyable and memorable and will definitely be going back for more umm information (but also free beer). I would really recommend anyone to do the tour at least once.

R we being SAS enough about the future?

by Berndt Lindner (berndtlindner@gmail.com), Stellenbosch Universtiy

This article started out with humble beginnings, namely with a link to a very interesting article by News24 entitled "Glimpse into the future" [3]. The aritcle highlighted the parallels of the big data and analysis company SAS's (Statistical Analysis System) beginnings in 1976 with Steve Jobs' first commercially available personal computer, the Apple-I. This led me to another article by the New York Times published in 2009 entitled "Data Analysts Captivated by R's Power" [6], and before I could get another cup of coffee, my internet tabs bar started getting very crowded with related links (don't pretend you don't know what I mean), specifically on what SAS exactly is and how it compares with other software. Alas, I had to close Goolge chrome and write down what I found online.

SAS

SAS is an analytics software suite developed by the SAS Institute, which is the world's largest privately held software company [3, 4]. The company boasts on their website that SAS is used at more than 70 000 sites in 138 countries, including 93 of the top 100 companes on the 2014 Fortune 500 list. As cited by [3]: "*the way Apple put the personal into personal computer, SAS pinned down big data long before it got big.*"

Figure 1: James Goodnight, co-founder and CEO of the SAS Institute since 1976 [2].

Dr James Goodnight co-founded the SAS Institute and is the current CEO. Further information on SAS software and its optimisation capabilities are highlighted in the next article in this Newsletter entitled "Integrated Analytics" (page 7).

Predicting Crime

Interestingly, James Goodnight has shared some thoughts on the concept of predicting crime, similarly in concept to the movie *Minority Report*. If you haven't seen the movie, it's about psychics in a "PreCrime" police unit apprehending criminals who intend to commit a crime in the future. This means that there will hopefully be no crimes, since they are stopped before being commited. Goodnight, however, sees this happening more on a predictive analysis basis rather than based on precognitive powers.

When asked " Do you foresee a time when people are taken into protective custody based on the likelihood that they will commit a crime?", he responded "Yes, I do. We will certainly be able to forecast at a high probability level. There is a constabulary in the UK that already did that; they were able to forecast that a certain person would be doing a robbery within a certain period after being released from prison, so they followed him and caught him in the act. In Iraq and Afghanistan, SAS was at the centre of a programme to forecast the location of IEDs (improvised explosive devices), and was close to 30% accurate. This saved a lot of people's lives"[3].

However, Dr Goodnight refuses to be drawn on the possibility of arrest or search warrants being based on predictive analytics. "It will be up to the courts and legislative system to come up with the rules. I'm not a lawyer; I'm just a developer" [3].

SAS and other programs

I must admit I have never used SAS, or had the desire to, but after reading the above I am keen to reconsider. As far as I can tell, the software isn't free. An important consideration for me with software is the cost. Programs like Matlab and SAS I will probably never try out, unless I am obliged to, whereas I downloaded and learnt a bit of Python just for interest, and am currently doing most of my work in R. This for me is one big benefit to free or trial versioned software, the fact that if you are considering use of a program, you can answer a lot of questions just by downloading it and playing around with it.

There is, however, a flip side to that coin. Although commercial use of free programs like R is increasing, many users still prefer a well-tested software system that is well supported by an established company, usually charging a fee. For instance, the banking industry, which relies heavily on the application of statistical methods rather than the development of new ones, would probably prefer to make use of commercial software vendors that they know will be a phone call away as part of their maintenance and support agreement. But this is a whole argument on its own – I will

rather fill the following spaces with some information on how SAS and other software programs compare.

One way of measuring programs is their popularity – note that the empahisis is on popularity, not on performance. Obvioulsy this will differ across different end user groups (statisticians or business analysts in academia or industry, for example). Most of the information provided is from an R user centered website [1]; so it focusses more on data anlaysis software and may be a bit biased towards R, but this will hopefully just open up the door to find out more.

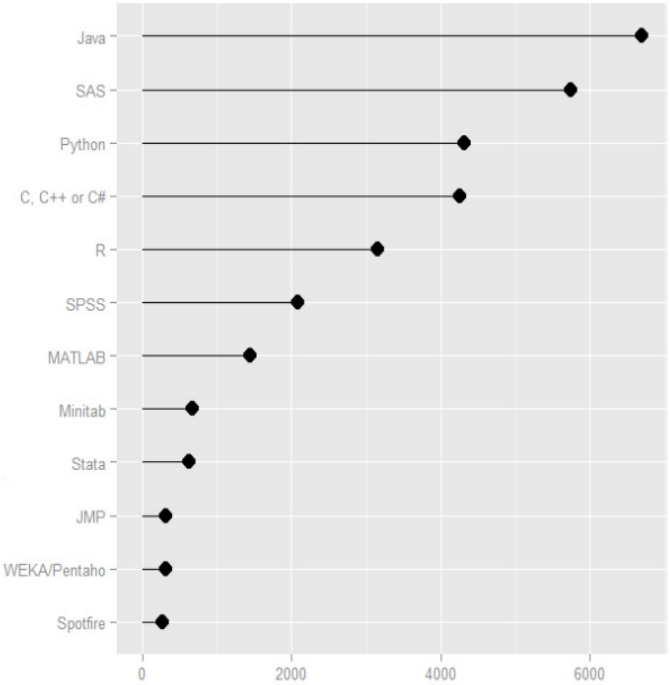


Figure 2: The number of analytics jobs on Indeed.com for the most popular software [1].

Figure 2 shows the number of analytics jobs on Indeed.com for popular software available.

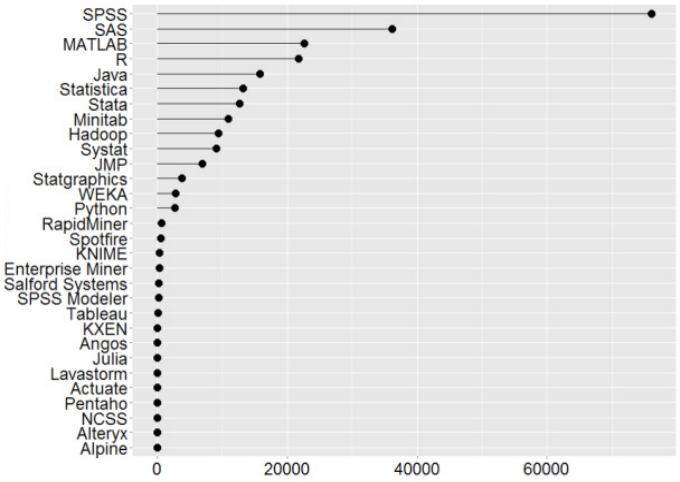


Figure 3: The number of Google scholarly articles found for each software [1].

For academia the picture is bit different (Figures 3 and 4) with SPSS and SAS leading the way. However, their dominance is waning as a result of programs such as R.

Figure 5 shows the number of books written on each data analyis software; note that this is specifically for data analysis software.

Figure 6 shows the top 30 computer programs according to IEEE Spectrum [5]. Note that this is for all programs – not specifically statistical software.

Another important measure is the number of people using a specific program. Java, which is one of the most

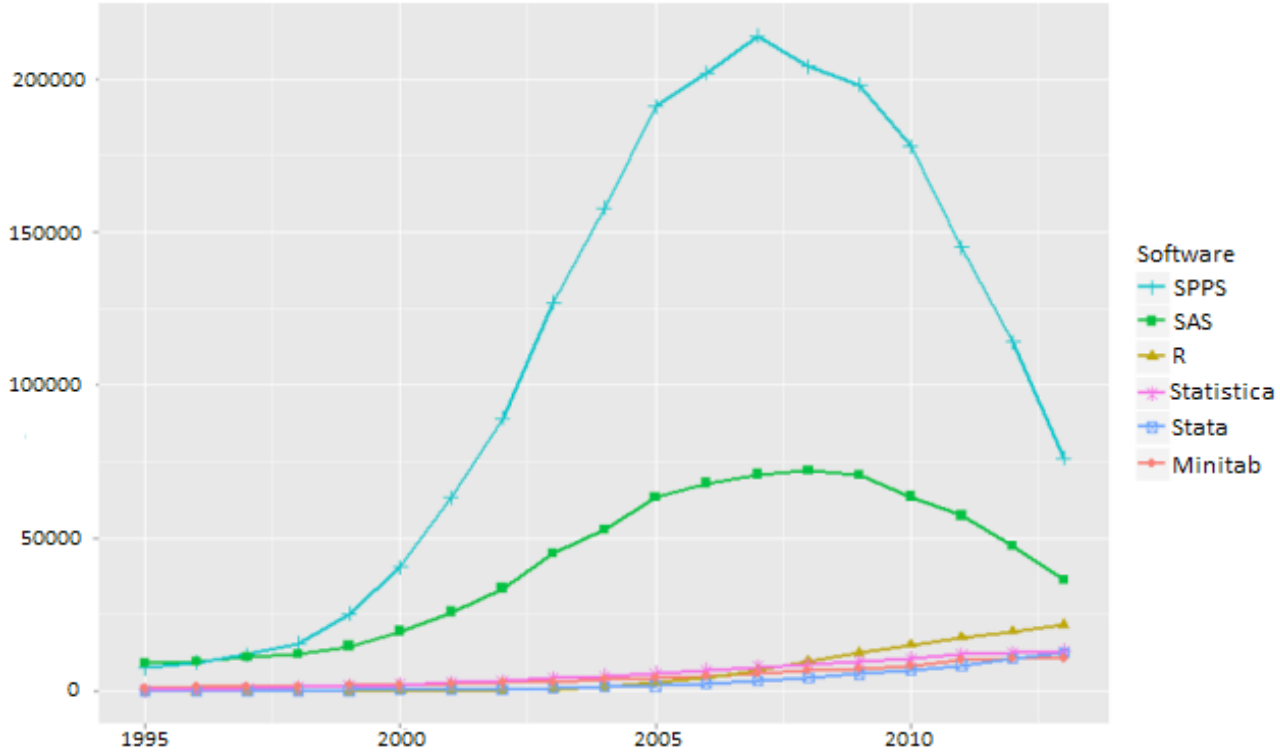


Figure 4: The number of Google scholarly articles hits for the top five classic statistics packages software [1].

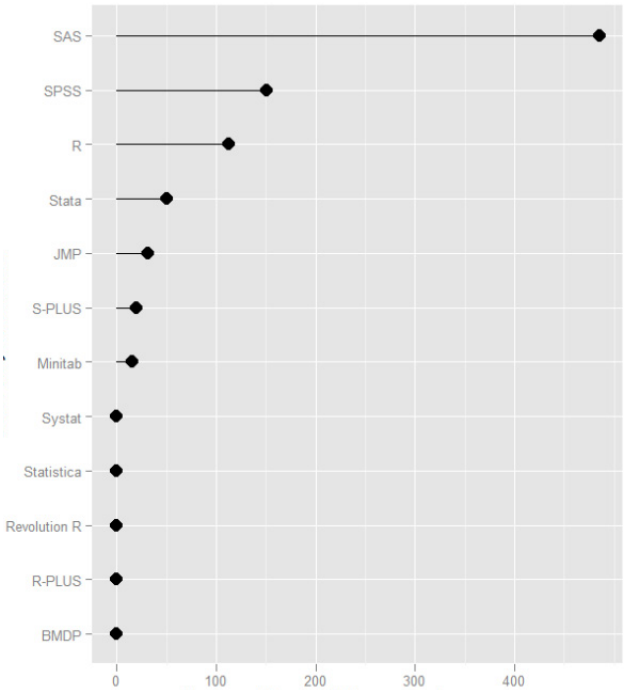


Figure 5: The number of books written on each data analysis software suite [1].

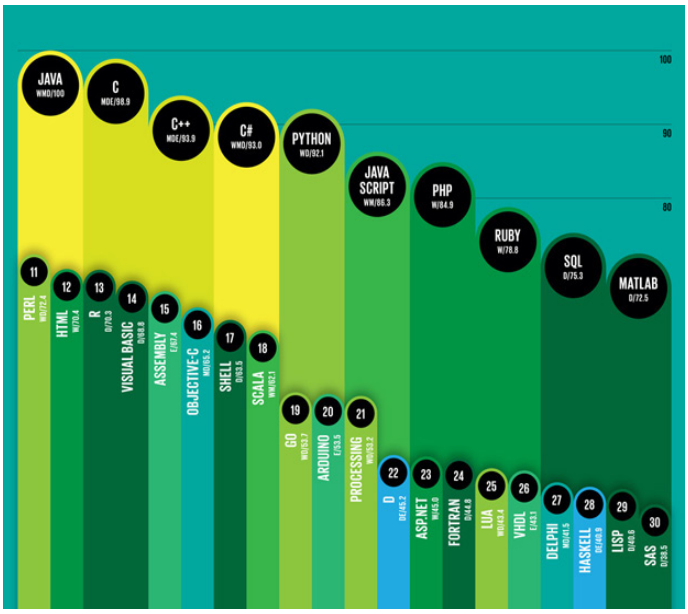


Figure 6: The top 10 and 20 following ranked computer programs according to IEEE Spectrum's weighted and combined metrics [5].

popular programming languages in use, particularly for client–server web applications, is reported to have 9 million developers [8], whilst the the number of Python programmers in the world is estimated to be in the low millions (estimates ranging from 1.8 million, 2.8 million, 3.5 million, and 4.3 million) [9].

There are more than 1 million users of MATLAB worldwide, according to the Mathworks webiste [7]. It is difficult to calculate the number of people using a software suite. The NY Times estimated back in 2009 that close to 250 000 people work with R regulalry [6], this figure has no doubt grown vastly. I quickly tried to look online for the number of SAS users, but could not find an accurate enough estimate or indication.

SAS or R

As noted by the New York Times [6], R's popularity at universities could threaten the SAS Institute, whose software has been the preferred tool for scholars and corporate managers.

SAS says it has noticed this threat, despite its educational discounts on its own software. But dismisses R's technology as being only of interest to a limited set of people who work on very complicated tasks [6]. Anne H. Milley, the director of technology at SAS, said of R, "I think it addresses a niche market for high-end data analysts that want free, readily available code." She further added, "We have customers who build engines for aircraft. I am happy they are not using freeware when I get on a jet."

Interestingly, companies like Google and Pfizer say they use R for just about anything they can. Google apparently uses R to help understand trends in ad pricing and illuminating patterns in the search data it collects, which I would like to find out more about. Pfizer has apparently created customized packages for R so that its scientists manipulate their own data during nonclinical drug studies, rather than sending the information off to a statistician [6].

It is interesting to note the co-creators of R have actually expressed satisfaction that companies profit from the fruits of their labour and that of hundreds of volunteers [6].

"R is a real demonstration of the power of collaboration, and I don't think you could construct something like this any other way," says Ross Ihaka, who is one of the two co-founders of R. "We could have chosen to be commercial, and we would have sold five copies of the software" [6].

Conclusion

In conclusion it seems the sci-fi movies might be closer than what we think about predicting future events like crime and possible explosions accurately. The big question on my mind is what software will be preferred, or will there necessarily be one ring to rule them all? I think not. I will look out for SAS and R in the future. I am also glad to have learnt more about the popular programs and software suites available to us and hope this article did that for you as well.

If this article sparks any comments or maybe even debates, please feel free to contact me. I think more research on this would be of interest.

References

[1] http://r4stats.com/articles/popularity/

[2] http://en.wikipedia.org/wiki/James_Goodnight

[3] http://www.fin24.com/Tech/Opinion/Glimpse-into-the-future-20141031

[4] en.wikipedia.org/wiki/SAS_Institute

[5] http://spectrum.ieee.org/computing/software/top-10-programming-languages

[6] http://www.nytimes.com/2009/01/07/technology/business-computing/07program.html?pagewanted=1&_r=1

[7] http://www.mathworks.com/company/aboutus/

[8] http://en.wikipedia.org/wiki/Java_%28programming_language%29

[9] http://www.gilesthomas.com/2013/06/how-many-python-programmers-are-there-in-the-world/

Integrated Analytics

by Fanie Terblanche (fanie.terblanche@nwu.ac.za), North-West University

It is widely understood that predictive modelling allows for more than just forecasting – we are able to gain a better understanding of the problem being modelled by examining the estimated model parameters. However, predictive modelling is often considered to be the final and conclusive step in the analytics process, while a further, potentially far more valuable step in the process is neglected. The opportunity for concrete value-add emerges from the further utilisation of the outputs of a predictive model.

Consider an example from the telecommunications industry. A predictive model might yield forecasts of future bandwidth demand, which would in turn determine whether the expansion of network infrastructure, a prohibitively expensive undertaking, is required. With a satisfactory predictive model, however, the next step is to find the most cost-effective network configuration that will satisfy the predicted demand requirements, *i.e.* we need to solve a network optimisation problem. As another example, consider the problem of direct marketing optimisation within banking. Having determined the probability of product take-up for each customer segment, the next step is to select the best subset of customers to target in a marketing campaign in order to maximise potential profit while satisfying risk and budgeting constraints.

In both these examples the results obtained from predictive modelling are primary inputs to an optimisation problem. More formally, within the context of an analytics framework, optimisation is considered to be part of what can be referred to as prescriptive analytics. That is, results from an optimisation model prescribe the "best action" to take in future, assuming that future events will realise in accordance with the results of the underlying predictive model. The competitive advantage of optimis-

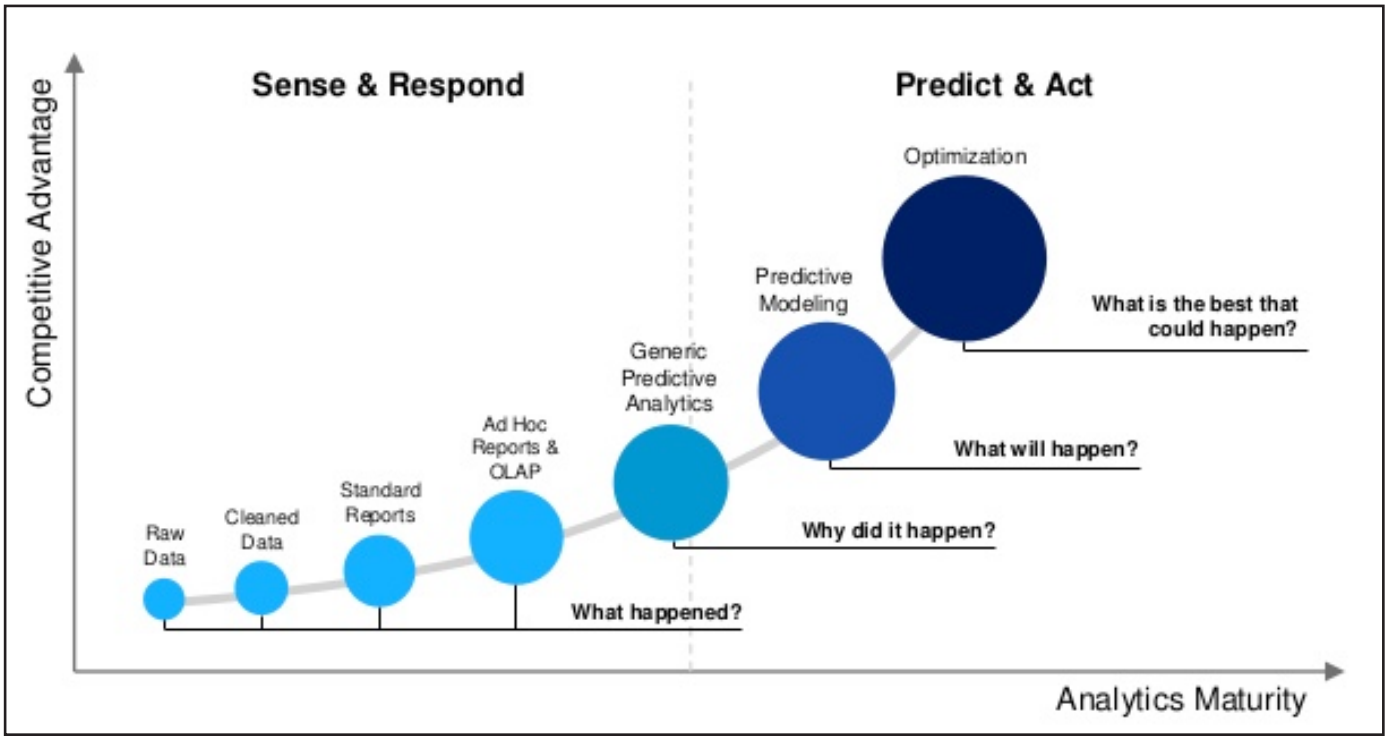


Figure 1: Value-add to business as function of analytics maturity - sourced from SAP SE.

ation as part of prescriptive analytics is illustrated in Figure 1, within the context of an analytics maturity model.

Traditionally, the application of analytics entailed making use of two separate tool sets – one for the statistical and predictive modelling, and the other for solving optimisation problems. SAS has been successful in providing an integrated environment for doing both. In addition to its legacy suite of optimisation tools, SAS has also introduced a new module which allows the user to specify a formulation of an optimisation problem in an algebraic format. This functionality bears some similarity to the way typesetting is done in LaTeX.

For illustrative purposes, consider the portfolio investment problem, set within the classic mean-variance optimisation framework. The inputs to the problem comprise estimated returns for a set of assets as well as the covariance estimates describing the co-movement of the asset prices. The preparation of the inputs will require only a few lines of code in SAS proc IML. Let us assume for now that the necessary code has been written to generate two data sets called est_returns and est_covariances, capturing the estimated returns and price covariances for the universe of assets under consideration. The next step is to formulate and solve the mean-variance optimisation problem using SAS's proc optmodel. To assist with the notation used in proc optmodel, consider the following formulation of the mean-variance optimisation problem (the set A in the formulation is used to index the assets, the decision variable x_i stipulates the optimal proportion to be invested in asset $i \in A$, r_i denotes the estimated return of asset $i \in A$, and σ_{ij} the covariance between assets $i \in A$ and $j \in A$. The objective is to

$$\begin{aligned} \min \quad & \sum_{i \in A} \sum_{j \in A} \sigma_{ij} x_i x_j \\ s.t. \quad & \sum_{i \in A} x_i = 1 \\ & \sum_{i \in A} r_i x_i \geq R \\ & x_i \geq 0, \quad \forall i \in A \end{aligned}$$

Where R is the target return of the portfolio. The process now involves mapping the data sets est_returns and est_covariances, to the optimization parameters r_i and σ_{ij} denoting the returns and covariances respectively. Figure 2 is a code snippet of how the data from the two data sets are read into arrays ret and sigma, representing the parameters r_i and σ_{ij}, respectively. Note that the data set est_returns has two columns, the first containing the index number of each asset, and the second, labelled "return", containing the returns. Similarly, the dataset est_*covariances* has two columns for the index numbers {*i,j*} and a column labelled "variance" for the covariance values.

```
set <number> A;        /* set for indexing assets */

number ret{ A };       /* average returns */
number sigma{ A, A }; /* covariance matrix */


/* reading data into array ret */
read data est_returns into
    A = [i] ret = return;

/* reading data into matrix sigma */
read data est_covariances into
    [i j] sigma = variance;
```

Figure 2: Code snippet of SAS optmodel showing the population of arrays used in mean-variance optimisation problem.

```
/* variable definition */
var x{ A } >= 0;

/* objective function */
min z = sum{ i in A, j in A } sigma[i,j]*x[j]*x[i];

/* constraints */
con sum_weights:
    sum{ i in A } x[i] = 1;

con expected_ret:
    sum{ i in A } x[i]*ret[i] = target_ret;

solve;
```

Figure 3: Code snippet of the formulation of mean-variance optimisation problem in SAS optmodel.

The actual formulation can now be completed, as shown in Figure 3, by starting with the declaration of the variables (indexed by the set A) and then formulating the objective function and constraints.

The power of an algebraic modelling language becomes evident when comparing the code in Figure 3 to the mathematical formulation above. Not only does it provide for fast prototyping of optimisation models, but it also reduces data input errors by providing a clear interface for mapping problem data to the optimisation formulation. The use of algebraic modelling languages for specifying optimisation problems is, however, nothing new (see e.g. AMPL, GAMS, AIMMS, etc.). The fact that this functionality is made available in an environment which also offers a variety of additional analytic tools is what allows SAS to remain at the head of the pack. Another recent feature added to SAS proc optmodel is the ability to define sub-problems and solve them in an iterative manner. This allows for the implementation of decomposition approaches (*e.g.* Bender's technique) that require solving a master problem and a dual sub-problem while exchanging primal and dual solution information. It is no surprise that an open-source alternative for an integrated analytic tool-set already exists. If you attended the workshop at this year's ORSSA con-

ference you would have been one of the lucky ones to get a hands-on tutorial in using this tool-set.

Figure 4 gives a snapshot of SolverStudio, an open-source algebraic modelling framework available as an Excel add-in. It allows you to formulate your optimisation problem with an algebraic modelling language like AMPL and solve the problem using either open-source or commercial solvers like CPLEX or Gurobi. An alternative to using an algebraic modelling framework would be to use a low-level programming language like C++ or Java and to link into a solver library. Programming code then needs to be written for populating solver-specific data structures and executing the optimisation routines provided by the solver library. The major benefit of doing this is the access gained to the internal workings of a commercial solver. Most solvers, like CPLEX or Gurobi, provide call-back functionality that allows a programmer to inject custom code into the optimisation routines executed by the solver. For example, the use of a cut call-back function allows for the implementation of valid inequalities as part of the Branch-and-Bound approach for improving computing times of hard combinatorial optimisation problems. Call-back functionality to access the internal mechanisms of a solver is still limited for most of the algebraic modelling frameworks. Many real-world optimisation problems are, however, of a combinatorial nature and cannot be solved in reasonable time with standard optimisation approaches that do not allow customisation. The ease with which optimisation problems can be formulated using algebraic modelling frameworks has changed the pace at which industry can develop end-to-end analytic solutions. There is, however, still room for improvement for software vendors like SAS and open-source communities, by enhancing algebraic modelling frameworks with call-back functionality.

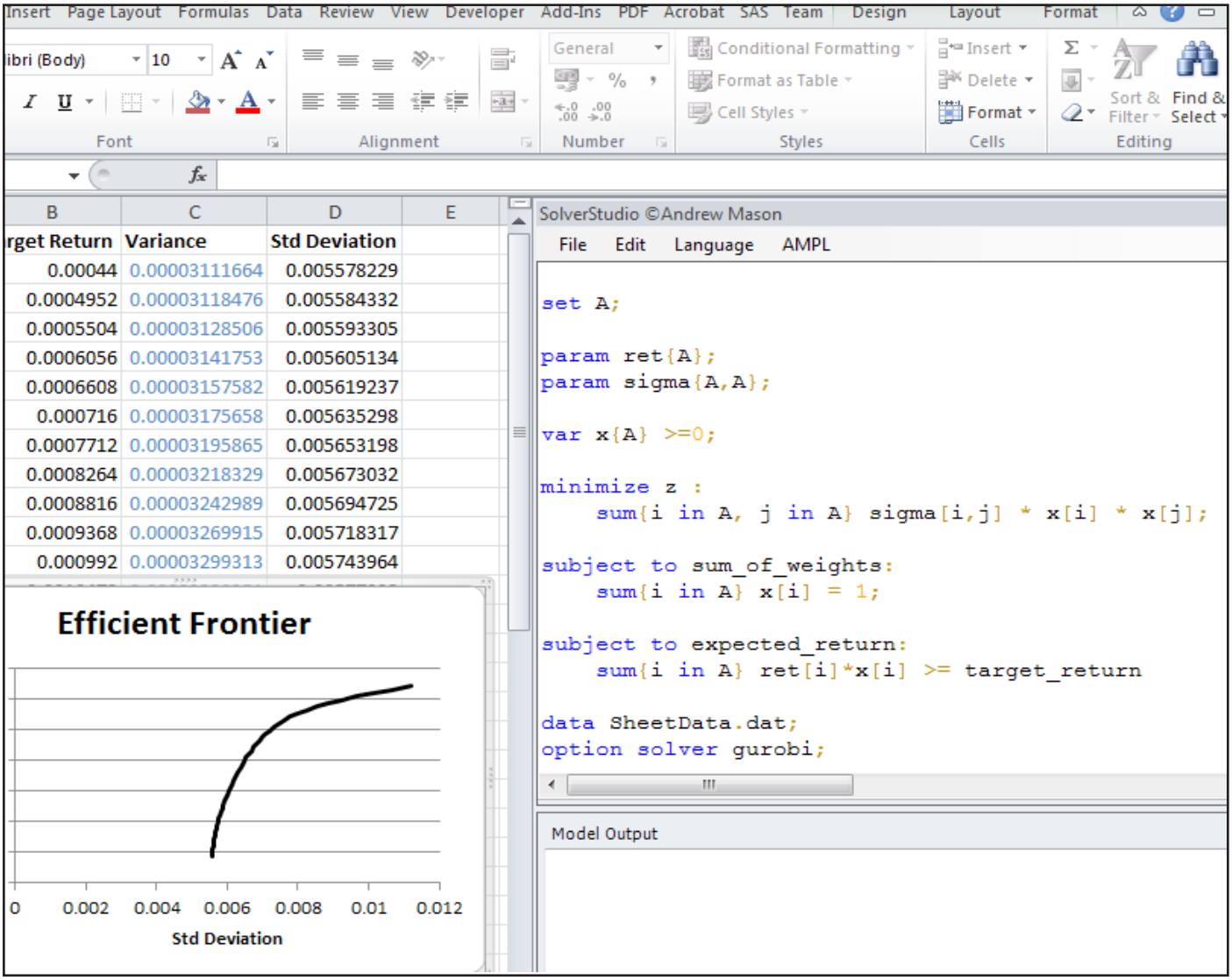
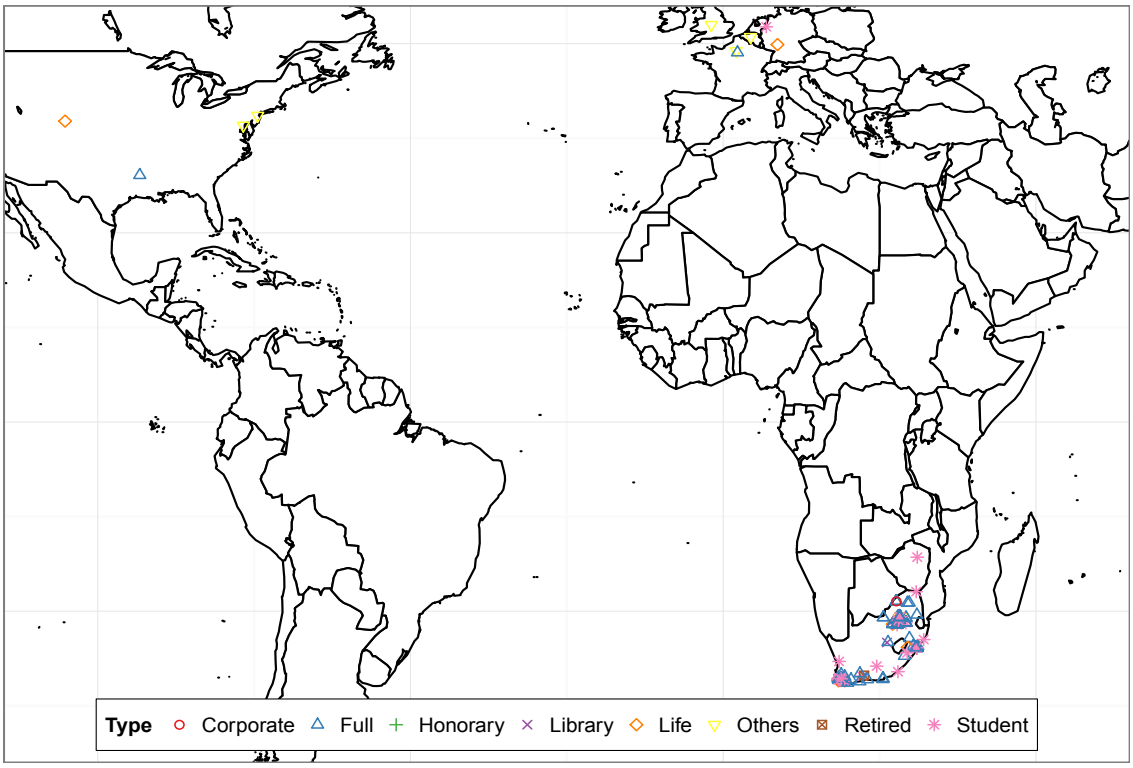


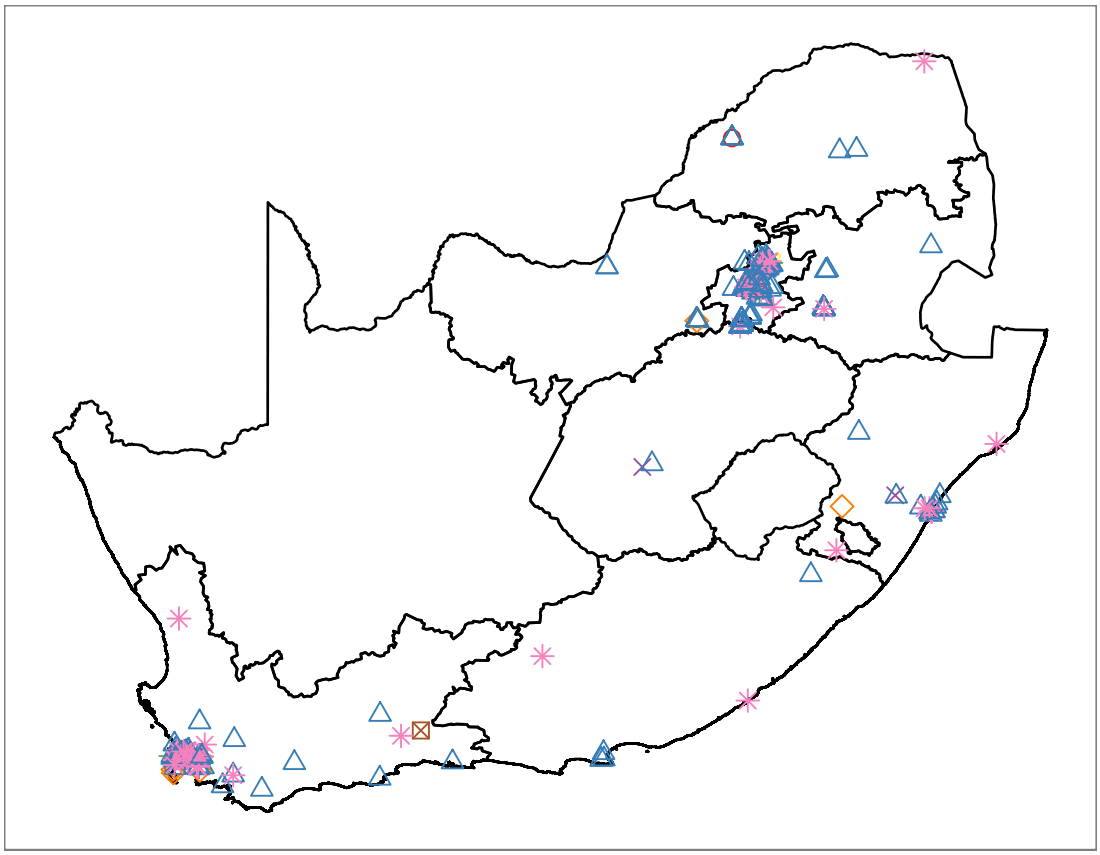
Figure 4: Snapshot of the mean-variance optimization problem implemented in Excel using SolverStudio.

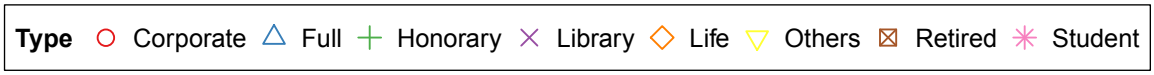
ORSSA Members Profile Maps

by Berndt Lindner (berndtlindner@gmail.com) and Marc Hatton (hatton.mn@gmail.com), Stellenbosch University



ORSSA members' locations according to postal addresses. Maps created in R; thank you to Ian Durbach (Database Manager) for providing data.





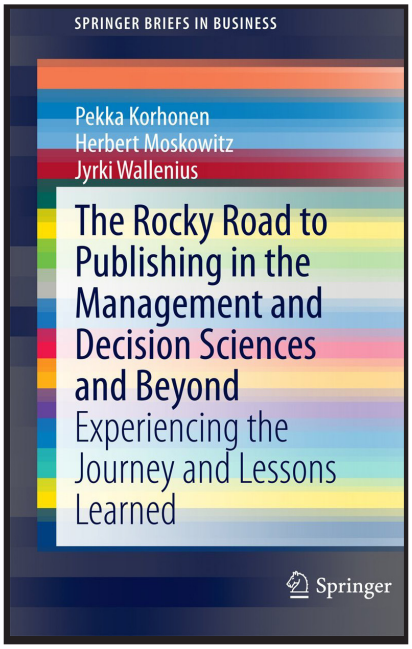
South African ORSSA members' locations according to postal addresses.

Book Review: The Rocky Road to Publishing in the Management and Decision Sciences and Beyond: Experiencing the Journey and Lessons Learned

by Hans Ittman (hittmann01@gmail.com)

An unusual title for a book that was authored and published by three very experienced researchers in the field of Management and Decision Sciences. The book crossed my path by chance as I was scrolling through a list of new and recently published books. The title caught my eye and I was immediately intrigued by what this "rocky road to publishing" entailed! For those involved in the "Publish or Perish" game this is a very useful reference covering all the aspects that one should consider in publishing scientific papers.

In working with graduate students many years ago, the authors realised that their students lacked understanding and required guidance in publishing in international peer reviewed journals. Given the experience the authors themselves had gained, they produced a monograph as a guide to their students on this topic and, given the success and interest in the monograph, this then evolved into the publishing of the book *The Rocky Road to Publishing in the Management and Decision Sciences and Beyond: Experiencing the Journey and Lessons Learned*. Not only is the book very useful to those that are aspiring to publish scientific papers, but I believe a wider audience will also find this interesting, especially in gaining an in-depth understanding of what the publishing of papers entails.



Two real case studies, both published by the authors, are used to illustrate and share the experience of the "pathology" of the publishing process. Both case studies were chosen carefully to make it accessible to those not working in this scientific field. However, a number of related and critical aspects that impact the probability of publication as well as the duration of the review process, in general, are highlighted upfront. The following are mentioned but it is noticeable that these also emerge strongly in the presentations of the two case studies:

- *Research Contribution* – this is possibly the most important factor that needs to be considered when contemplating to submit a scientific paper for publication. What is the research contribution and what is the value add to the existing literature on the topic?;
- *Communication Quality* – is the paper well-written, clear, providing an integrated and comprehensive "story" supported by a well-presented scientific analysis with a proper conclusion?;
- *Journal Selection* – the journal selected should be consistent with the quality and relevance of the work reported on in the research paper;
- *Responsiveness to Reviews* – comments, suggestions and advice provided by reviewers and editors should be addressed in a satisfactory and comprehensive manner. If there are differences of opinion it is up to the authors to endeavour to resolve these; and
- *Reducing Publication Lead Time* – the publication of papers can be a lengthy process and therefore it is essential that authors should endeavour to try to shorten every aspect of the process.

The first case study used as an illustration is titled: *Choice Behavior in Interactive Multiple Criteria Decision Making*. It is based on experiments conducted to investigate howstudents made choices using a *Multiple Criteria Decision Support System* (MCDSS). At that stage this was a relatively new area of research. A first version of the paper was written in December 1986 and sent to the third author, Moskowitz, who provided detailed comments. This then led to a number of revisions, with the three authors collaborating very closely during this process. Feeling pretty good about the paper, the first submission was to the journal, Management Science, in October 1987. The response was negative and both the paper reviews and journal editor felt the paper was not appropriate to be even revised and resubmitted to the journal. Nevertheless detailed constructive suggestions and comments were received from the reviewers. The authors were meticulous in taking these into consideration in revising the paper and then resubmitted it to Naval Research Logistics in June 1988. The motivation for this was that since it was a new research area, they believed that the reviewers of Management Science did not fully understand and appreciate what the paper was trying to convey. Again the paper was rejected mainly on the basis of one reviewers'

reports and again the journal declined a response and revision! A special edition of Annals of Operations Research was going to be published on a topic that was very close to what thepaper was about and this journal was therefore selected to re-submit the paper after some revisions were done. The paper was conditionally accepted, but required further work. Version 6 of the paper was finally accepted in November 1989, a long and laborious process!

What is very valuable is that in most cases the specific version of the paper is reproduced in the book as well as the letters to and from the editors of the journals and also the detailed reports from the reviewers. The process of responding to these constructive and also negative comments, and how the authors went about addressing these, are described in detail while highlighting the necessity of doing this meticulously. In one instance a four page detailed response was prepared to address issues raised. An analysis is provided of all the reviewers' comments. This detailed analysis, as well as the description and outline of how authors should respond to feedback and comments from reviewers, should be of huge value to those aspiring to get papers published.

The second case study revolves around a paper titled *Can a Linear Value Function Explain Choices? An Experimental Study* that was submitted electronically to the European Journal of Operational Research in July 2011. One revision was required based on the feedback of two reviewers and the paper was resubmitted in November 2011. The authors gave detailed responses to all the aspects, issues, queries and comments of both reviewers – both these two responses are reproduced as well as the final version of the paper. Some of the main reasons for the fast turn-around was the fact that the field was much more established, the authors were more experienced – not just in terms of what was initially submitted but also the way the responses were handled and also the fact that submissions and responses were all done electronically. The entire process of getting this paper published is described in detail which is again of huge value.

One of the most striking aspects of publishing and specifically the reviewing of papers that was reiterated over and over is the critically important role reviewers as well as editors play. Asking the right questions, raising alternative views or providing constructive criticism are all examples of how their inputs can stimulate authors to improve the quality of the research outputs.

In a chapter titled *Epilogue,* reflections are provided on the contrasting processes followed in the two case studies while the following lessons learnt in writing of journal articles are given:

- Failure is not an option;
- Get it right the first time (or there may not be a second time);
- Publishing is a painful process for everyone;
- Reviewers are human: they make mistakes; and
- Reviews provide fresh ideas for future research.

Finally, some guidelines for success are provided; some caveats to the publishing "business" are given as well as some additional considerations for visibility and experience, and a few final remarks. At the end of the book there are four appendices with Appendix 1 providing guidelines to writing grant proposals; Appendix 2 giving an editor's perspective on experiences of editing a journal; with the final published versions of both papers reproduced in full in Appendices 3 and 4.

A truly fascinating book providing an inside view into the world of publishing scientific papers!

Book info: ***The Rocky Road to Publishing in the Management and Decision Sciences and Beyond: Experiencing the Journey and Lessons Learned*** **by Pekka Korhonen, Herbert Moskowitz and Jyrki Wallenius, 2013. Springer-Verlag, Berlin, Germany, pp 193, ISBN 2191-5490 and ISBN 978-3-642-42047-4, 41.24 US Dollars (Paperbag), 46.94 US Dollars (Kindle).**

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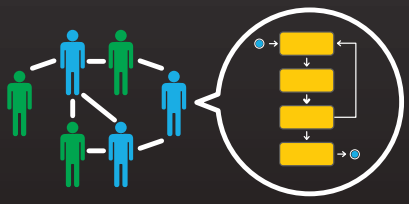

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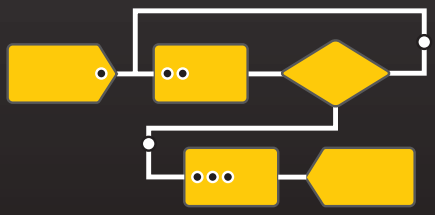

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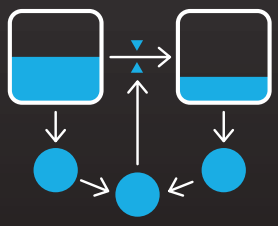

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