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NEWSLETTER

DECEMBER 2004

New Year is a time for resolutions for "doing things better". This Newsletter provides two views on how businesses can do things better – optimisation and data mining. We look forward to those resolutions!

Data Analysis Australia and staff wish our clients the best for Christmas and the New Year.

Dr John Henstridge
Managing Director

Finding the Optimal Solution

In any environment there is constant pressure to do everything better, faster and cheaper. This often means finding the best way of using the available resources to maximise profit or outputs. Optimisation is the art and science of finding this best solution.

Optimisation involves setting up a mathematical model for the problem, specifying in quantitative terms the cost structures, the constraints and a clear idea of what is meant by an "optimal" solution. The model is an approximation of reality but one that is close enough to be useful. Most importantly, the model allows numerical algorithms to find a solution.

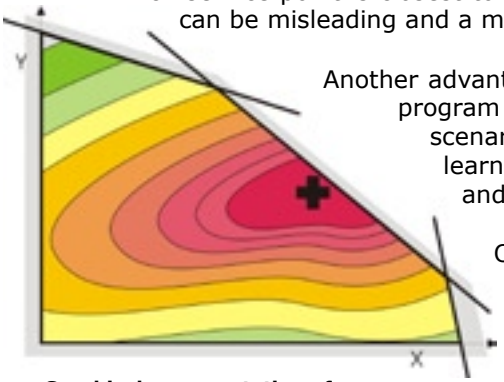
Mathematical methods are at the centre of modern optimisation. Of these, linear programming is by far the most successful method. First developed in World War II to solve problems such as convoy planning, it has been shown to have a very wide range of applications and, just as importantly, efficient algorithms have been found so that it can be used on problems of any size, even those with tens of thousands of parameters.

The first step in the optimisation process is to convert operating or system rules and procedures into a precise mathematical form. This step should never be underestimated, both in terms of the effort involved and the benefits that come from that precision. This is best handled through a partnership of someone familiar with the system and an experienced mathematician. It is often a process of discovery since frequently constraints have only been understood intuitively and rarely documented.

The question of *what* is being optimised is also critical. Sometimes it is obvious (it might be simply profit) but for some systems it can be subtle with several criteria needing to be optimised at the same time. This can be done through applying weights to each of the criteria reflecting their relative importance.

In some situations the optimisation process may give solutions that are quite unexpected. This may highlight a failure in identifying some feature of the system such as a constraint. Alternatively, since the mathematical methods have no preconceptions as to where the solution should lie, they might have suggested viable solutions that people too close to the system cannot see.

Data Analysis Australia uses optimisation modelling to assist clients in finding the best way to run their operations. An example is the siting of new services to ensure cost effective access over the metropolitan area, both now and in the future. This requires forecasts of where future demand will come from (a statistical problem in itself) and a way of measuring access. Typically the aim will be to minimise the distance or time that clients for the service will have to travel on average. The effect of moving the location of a service point is usually not trivial, since it will make it more accessible to some and less accessible to others, sometimes changing which service point is closest to a client. This complexity means that *ad hoc* solutions can be misleading and a mathematical optimisation can be substantially better.



Graphical representation of a mathematical optimisation model

Another advantage is that the optimisation model can be set up as a program that the clients can run themselves, examining various scenarios and evaluating the results. This can be a way of learning what affects their system, how it affects their system and is a cost effective way of testing proposed solutions.

Optimisation modelling can be used to find a solution to any problem where demand needs to be met using limited capacity. For more information on optimisation modelling and its applications, contact **Sarah Barnes.**

Data mining is an area commonly talked about today but rarely defined. Historically to statisticians the term "data mining" had overtones of scraping the bottom of the barrel to find something to support preconceived ideas. Today it is a term more frequently used by computer scientists, market analysts and software engineers. But just what is it?

Many organisations engage in what they refer to as data mining and for a large section of business it has become synonymous with having a better understanding of customers and targeting marketing towards particular groups. A typical application is predicting who will respond to a marketing campaign. But it is clearly much more than this.

The most recent paper in our Analytical Ideas series presents the statistician's view of Data Mining and argues that statisticians are uniquely placed to utilise these techniques. This paper can be found at www.daa.com.au/analyticalideas/2004/datamining.html.

COMPANY NEWS

Dr John Henstridge and **Professor Cheryl Praeger,** directors of Data Analysis Australia, recently commissioned two sculptures by artist **Peter Kovascy** for our office building. Many thanks to **Dr Ken Michael,** Chancellor of the University of Western Australia, who launched the sculptures at a recent Data Analysis Australia function to celebrate the arrival of the sculptures. For more information on the function, the sculptures and the artist please visit www.daa.com.au/function.

Branch Manager **Jodie Thompson** recently represented Data Analysis Australia as an invited speaker at the Fremantle 2020 conference. Jodie spoke about current and future population demographics of the area. The conference focused on creating a vision for Fremantle in the year 2020.

In October **Chris Milne** was invited to speak to undergraduate students at his alma mater, Murdoch University, about careers in statistics.

Dr John Henstridge has recently returned from a second trip to Sri Lanka where he was part of the team analysing a survey on rural electrification for the Asian Development Bank.

STAFF PROFILE

These newsletters don't just plan and write themselves. One of the driving forces behind them is **Sarah Barnes,** the newsletter editor, who is also a Consultant Statistician and Business Analyst at Data Analysis Australia.

Sarah has dual qualifications of a Bachelor of Arts in Statistics and Bachelor of Commerce from the University of Queensland in Brisbane that gives her a strong background in these two areas. She gained valuable experience in business analysis working at the Australian Taxation Office and in customising database systems overseas.

A love of travel has seen Sarah traverse the globe, visiting countries in Europe, Africa and North America and also working for a while in London at a law firm. Originally from Brisbane, Sarah moved across to Perth last year to join Data Analysis Australia and explore her statistical ancestry. Her combined commerce and statistical experience has assisted Data Analysis Australia in expanding the field of business analysis, working for clients such as the Department of Justice, Western Power and Hamersley Iron.

CLASSIC QUOTE

Investment clubs … by pooling your money with a group of other investors, the commission burden is shared. If a club with six members splits the 2.25 per cent share dealing fees, the cost is slashed to just 0.375 per cent per person.

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97 Broadway
Nedlands WA 6009
Telephone: +61 8 9386 3304
Fax: +61 8 9386 3202
Email: daa@daa.com.au
Website: http:\www.daa.com.au