NEWSLETTER

September 1999

Operational Research Society of New Zealand (Inc.), PO Box 6544, Wellesley St. Auckland, New Zealand
http://www.esc.auckland.ac.nz/Organisations/ORSNZ/

EDITORIAL

Hi all, Can I start out by asking you all a couple of simple questions!: (1) what do you understand by the term 'operations research'? and (2) what would you like from the Operations Research Society in New Zealand in the future? Please email your responses to me so I can collate them for a future newsletter item.

In a previous editorial of this newsletter (June 1998), I made some observations about the changing field of OR/MS and ORSNZ over the last 20 years. I expressed the concern that I wondered whether our society was keeping up with the wider developments in the field, e g in the wider 'systems' and 'decision sciences' areas. Also I asked whether we should change the name of our society to perhaps better reflect the wider interests of the current members (as a number of other national OR/MS societies had done in recent years). Or perhaps ORSNZ could become a chapter of an "Australasian OR society"!

Although we invited you to write to this newsletter to express your opinions about the shape and direction of ORSNZ, unfortunately we have not yet received any correspondence on these subjects! Would you like to discuss these issues at an ORSNZ annual conference? Alternatively we could continue to put them in the 'too hard' basket and put them off well into the next millennium!

On a related matter, I would like to briefly comment on the recent combined International System Dynamics and Australia & New Zealand Systems Conference that was held in Wellington in July, hosted by Victoria University. It was a highly successful conference with about 320 participants from 31 different countries. (It is a pity that only 3 ORSNZ members could attend the conference!!). The conference theme was "systems thinking for the next millennium". Outstanding keynote addresses were presented by Professors Richard Bawden (scenario planning), Peter Checkland (soft systems methodology), Geoff Coyle (qualitative system dynamics), and Bob Flood (complexity theory). In total, there were about 200 papers presented, including plenary and parallel sessions and workshops on a range of systems, management science and action research topics. The conference proceedings and a CD-ROM of the papers are available from Roberta Spencer, Executive Director, System Dynamics Society, Milne 300, Rockefeller College, State University of New York at Albany, Albany, NY, 12222, U.S.A. (email: **System.Dynamics@albany.edu**)

Finally, I would also like to wish Hugh Barr a speedy recovery from his recent accident on Mt Ruapehu (see p10).

Best wishes to all for the new millennium,

BOB CAVANA, Victoria University of Wellington, email: bob.cavana@vuw.ac.nz

CONTENTS

Publication dates: March, June, September, December
Deadline for submissions: on the 15th of February, May, August, November (for following month's issue)
Send submissions as word attachments by email to Production Manager, Tricia.Lapham@vuw.ac.nz

NEWS FROM AUCKLAND

The time since the last newsletter seems to have just flown by. First semester courses wrapped up, some brief excursions into research, and then the second semester. And where has Andrew Mason been through all of this? Globetrotting! Andrew visited David Panton over in Australia, and together they continued their work on cyclic roster construction. Andrew then returned to New Zealand for a week, and ran around in a manic state. Then off to Europe. After attending the International Congress in Industrial and Applied Mathematics meeting in Edinburgh, he's now visiting Mikael Ronnqvist in Sweden. A quick detour to Beijing for the IFORS conference, and then back to Sweden. Whew!

Andy Philpott and David Ryan have also been building up frequent flyer points. In July Andy spent a week in Palo Alto at an invited workshop on applications of planning under uncertainty, and then a second week at another similar event in Minneapolis.

David has already made one excursion this winter to the International Congress in Industrial and Applied Mathematics meeting in Edinburgh, and at the time of writing David has just departed on his second trip - to the IFORS conference in Beijing. He has received the honour of being invited to be one of the plenary speakers at this conference. His topic, Real Operations Research - as opposed to fake (read unapplied) work - is sure to raise a few eyebrows, and a few hands in question time. No doubt he'll enjoy stirring things up over in China.

Shane Henderson has finally found some time to start writing up research results, and has been locked away in his room for quite some time. He only emerged to go on a field trip to Northland, and then returned, muttering something about simulation, to his office!

We welcome Professor Jeya Chandra as a visitor to Engineering Science this semester. Jeya, who hails from Penn State University, is an industrial statistician with interests in experimental design and process control. We also welcome Dr Tiru Arthanari back from a recent trip to India. Tiru has taken on the position of Publications Secretary for the Society, i.e. taking care of distribution of OR publications like the Conference Proceedings, and International Abstracts in OR.

With everyone travelling so much, it has been a busy time for the ground troops in Engineering Science, and we are looking forward to reinforcements in the near future. They will certainly be welcomed with open arms!

SHANE HENDERSON, University of Auckland, email:sg.henderson@auckland.ac.nz

NEWS FROM WAIKATO - DEPT OF MANAGEMENT SYSTEMS

Two colleagues, John Scott and Jim Corner are on sabbatical leave; John presently at Cambridge University in England and Jim at Arizona State University in Phoenix, Arizona. We have had a three week visit from Professor Tae Joon Jeon of Chonnam University in England. He worked with Les Foulds on various scheduling problems. John Buchanan attended the 5th international Decision Sciences Institute conference in Athens, Greece, back in July.

Much of our energies of late have gone toward developing a new degree - a Bachelor of Electronic Commerce Degree (see **http:\\ecommerce.ac.nz**), scheduled to begin next year subject to ministerial approval. While there is not a lot of Operations Research content immediately obvious in this degree, one relevant area is that of supply chain management, currently being developed by Chuda Basnet. In fact supply chain management is proposed to be one possible major in the degree. Other related areas include the use of decision tools such as shopping bots, on-line multiple criteria decision tools, negotiation tools and auctions.

Finally, the following was posed to John B on his last night in Athens by a Greek colleague. Two Bedouins are travelling across the desert on their camels. They see a sandstorm coming and search for a place to shelter. While they crouch behind a rock, the sandstorm rages for three hours. When it quietens down, they step out and see, about 100 metres away, a huge treasure uncovered by the sandstorm. Who should get the treasure? Should they share it? For reasons unknown, the two Bedouin decide that all the treasure will go to whoever's camel gets to the treasure second. So they sit around, waiting, drinking tea as the camels wander. Nothing much happens. Then a Greek happens to come by and enquires as to the situation. He proposes that, for 10% of the treasure, he will give them some good advice. They agree; after all it is a large treasure. He dispenses the advice and suddenly both Bedouin jump up, each grabbing a camel and race and fast as possible to the treasure. What was the advice?

JOHN BUCHANAN, University of Waikato, email:jtb@mngt.waikato.ac.nz

KEEP IT SIMPLE

ABSTRACT

A number of examples are given, where OR problems can be approached by simple approximate calculations.

INTRODUCTION

The more complicated an Operations Research model becomes, the harder it is to understand even when it is a good description of the real-world situation. If some essential qualitative feature has been omitted, then the results or predictions can be wildly wrong. To make it harder, if the model is complicated, then one may be unable to recognize an absurd or irrelevant answer when one sees it. However, one can sometimes do a simple (although rough) calculation, to tell us what ballpark we should be in. Some examples follow, remembered from over the years. I no longer have the numerical data: however the approaches could still be useful.

By way of further motivation, there is a story from the early days of computing, about a company that replaced their manual accounting system by a computer accounting system, and reported a saving. Subsequently, they replaced the computer system by a better manual system, and reported a further saving. If the tale is true, it would seem that their original system had much in it that was irrelevant to their needs, and only the exercise of putting it into computer programs enable them to sort out what was really needed.

SIMPLE APPROACHES

I remember from my long past paper industry days an investigation of the strength of cardboard boxes, how it depended on various raw material and manufacturing variables. The standard approach to such data was a multilinear regression. But in those distant days, there was no computer in Melbourne (where I was) to do a multilinear regression. So I grabbed all the graph paper and sharp pencils available, and drew lots of graphs. The graphs taught me a valuable lesson – the graphs were far from straight (the curves had “elbows” in them), so a linear calculation would have been grossly misleading. Now I already knew the standard errors of the various measured quantities, so I could put error bars on the graphs. Then the conclusions from the data became apparent, and further computation was not required. Today, one would have to run the data through a computer, in order to be believed. But (now as then) nothing substitutes for actually looking at the data, and it can well happen that the important conclusions do not depend on heavy computation.

I recall another paper industry incident, this one relating to dispersal of bitumen in recycled paper from cement bags. The experimental data took the form of numbers (typically up to 20) of dots of bitumen on sample sheets of paper. Lower numbers meant (desirably) better dispersion. How did this relate to manufacturing variables? Now there is a lot of statistical techniques for analysing such integer variables, often assuming Poisson distributions.

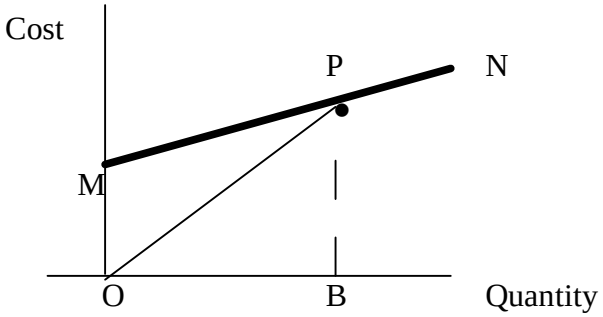
However, there is a usable approximate approach. The square root of a Poisson variable has variance roughly independent of the mean. So I tabulated the square roots of my small integer variables, and analysed these data by classical analysis of variance, pretending that the data followed a Gaussian distribution. Of course, that assumption was wrong, but it isn’t so bad a working approximation. I soon discovered that the underlying random variability was substantially larger than Poisson would account for (there must have been additional sources of variability) however, analysis of variance took all this in its stride.

SIMPLER COMPUTATION

As motivation, I recall the story of an American company, with warehouse in various cities to distribute their products. The management thought they needed more warehouses in more locations. They had an OR manager, who told them “this is an integer programming problem, which requires a bigger computer to solve”, and he got his bigger computer. However, one of his junior staff used the old computer after 5pm, with straight linear programming (only continuous variables) as an approximation to the problem. Of course this was rough, but he allowed for that, and managed to show that fewer warehouses than they already had, but in the right places, would be better for the company, than the intended increase in the number of warehouses. The story, as I read it, breaks off at this point, and does not narrate the subsequent firing of the junior employee for putting egg on the boss’s face!

I can bring this kind of problem up to date, though I must not identify a company. Consider a planning problem, involving starting production of certain things (and which things to choose), as well as the usual continuous variables for amounts produced in given times and allocations. The customary approach is to setup and compute a "mixed integer linear programming model". However, something may be learned from modifying the standard (continuous variables) linear programming model, considering sensitivity to costs, and computing a number of such models with various parameters.

Consider an activity, for which the cost (see diagram) involves a startup cost OM (only if the activity is running!), as well as a marginal cost shown by the line MN. A straight linear programming model would use the marginal cost (=slope of MN) as the unit cost for the activity, thus ignoring the startup cost OM, and hence over estimating the quantity. The optimum point P requires instead the slope of OP (the chord slope PB/OB) as the unit cost (through P is not known in advance). The same remark applies to other activities having start up costs.



Consequently, the optimum with startup costs corresponds to the optimum for a standard linear program with modified costs. The latter are not known in advance, so must be adjusted, requiring solving the linear program a number of times with varied unit costs. If (as may happen) a sensitivity analysis of the linear program shows that the optimum for the marginal costs remains optimal when they are increased to chord slopes, then the startup costs do not change the optimum.

HOW MUCH TO MAKE AN ADVANCE

A company makes a product with seasonal demand. There is a summer peak in demand, in excess of their production capacity, requiring stockpiling of some product in advance.

However, the height of the demand peak is variable, and cannot be accurately forecast. It has a probability distribution, which can be estimated from historical records.

The question posed was to generate production schedules, for the various components of the product. This was computed (by other people) from a mixed-integer linear programming model, assuming however a fixed figure for the peak demand – presumably derived from a crystal ball! Is there a better way to obtain such an estimate?

There is some analogy with the "newsboy problem" of the OR textbooks (see e g [1], page 340. In that problem, the newsboy must buy his papers in advance of sales, and the question is how should he balance the loss on unsold papers (if he orders too many) against the loss of future sales (if he orders too few)? An optimum answer is calculable, given a probability distribution is given for the excess summer demand peak (thus, the excess over production capacity). The loss on the profit per item sold, where q relates to the proportion of customers who, if once disappointed, will never come back. The production cost per item, corresponding to the price the newsboy must pay for each paper, is however not completely known in advance, because it involves an inventory cost, as well as the actual manufacturing cost. The inventory cost depends on how long the product must be stored, and that, in turn, depends on how much must be made, and so over how many months this production must be spread. So the optimum calculation would have to be done several times, on difference assumptions as to this time duration.

APPROXIMATE STOCHASTIC LINEAR PROGRAMMING

Consider a linear program with variable demand b:

F(b) :=MAX cx
Subject to $x \geq 0$, Ax = b,

but where now the demand b has a random component. It is customary then to replace the objective cx by its expectation **E**(cx). The techniques available for stochastic linear programming (see [2]) are likely to involve heavy computation. However, some approximations seem possible.

Suppose that the given probability distribution for b is approximated by a three-point distribution, thus $b = b_i$, (i=1,2,3) with probability p_i. (Usually $b_2 =$ **E**(b), $b_1 = b_2 - d$, $b_3 = b_2 + d$, for some suitable d. The numbers may be chosen (see [3], [4]) so that the three point distribution has the same mean and variance as, for example, a given Gaussian distribution for b. An approximation to **E**(F(b)) may be obtained as $\sum p_i F(b_i)$. Although not exact (since the function F(.) is not generally linear), it appears to be a useful approximation, which can be readily computed.

It is not however, obvious that expectation is the best criterion to be maximised. In other contexts, particularly decision trees, it is often appropriate to use a "risk-averse utility function", which may have the form $u(x) = 1 - e^{-x/k}$. This approach attaches less weight to larger (and uncertain) financial outcomes. The optimization would then proceed using utility u(x) in place of money x; and the final evaluations would be u^{-1}(**E**(u(x)). However, this is not convenient for a linear programming model, since the linearity is lost. A possible (rough) approximation would replace $\sum p_i F(b_i)$ by $\sum p^1_i F(b_i)$, with modified probabilities p^1_i summing to 1, but chosen to give smaller weight than p_i to the largest $F(b_i)$.

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1. R. Hesse and G Woolsey, *Applied Management Science – a quick and dirty approach*, Science Research Associates, Chicago (1980)
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3. D. L. Keefer and S. E. Bodliy, *Three-point approximations for continuous random variables*, Management Science 29 (1983) 595-609.
4. A. A. Miller and T. R. Rice, *Discrete approximations of probability distributions*, Management Science 29 (1983), 352-362.

B. D. CRAVEN, University of Melbourne *(Reprinted from the ASOR Bulletin Sept 98)*

REPORT ON THE 15TH TRIENNIAL IFORS CONFERENCE IFORS'99, BEIJING, CHINA 16 - 20 AUGUST 1999

The conference was held at the sprawling but sumptuous Friendship Hotel in downtown Beijing. There were 186 Chinese participants, 788 participants from elsewhere, and 235 accompanying persons. There were two plenaries, seven tutorials, and 1087 papers (divided into 27 streams). One of the plenaries was presented by David Ryan, on practical OR based, in part, on three New Zealand case studies, arising out of his work with AU colleagues and graduate students.

IFORS'99 turned out to be a nice blend of leading edge OR, which took place in an historic and cultural setting. The contributions came from all over the globe, representing both theoretical advances and examples of OR uses and applications.

It was a pleasant environment in which to renew existing relationships, to forge new ones, and to enjoy the splendid social events. The social program included a tour to the Great Wall and a Ming Tomb, and a glorious banquet.

With such a wide variety of presentations available, it was nice to be able to attend talks in areas completely different from one's own. NZORS was well represented, with contributed papers, session organisers and chairs, committee meeting attendance, and David's excellent plenary.

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THE PANDA PRINCIPLE

On a visit to Kalispell, Montana, I met a man who organised a senior citizen's walking club called the "Over-the Hillers". The sole object of the club is to go walking in the nearby Glacier State Park. He told me that as you grow old, three significant biological changes take place. First you start to lose your memory, and then … unfortunately he couldn't remember what the other two changes were!

So what has this to do with the Panda Principle? Well my friend in Lakispell also knew a lot about bears. We are all familiar with Darwin's theory of evolution based upon the survival of the fittest, but in practice species can survive perfectly well even though other species could occupy their niche more effectively. The fact that the Glacier State Park is populated by black bears means that over the years that species has managed to both live and defend its particular niche against intruders, even though some of these may have been superior. The Panda Principle states that:

Once a creature or entity is ensconced in a local situation it can resist being replaced, even by a better creature or entity.

Thus animals will develop to fill special niches and use these local positions of strength to fight off other animals which might be considered superior to themselves. They effectively prevent any competitor from gaining a foothold. The survivor is in fact a local optimum in creature space; it need not be a global optimum.

The Panda Principal is biological in origin and was first reported in S.J. Gould's book 'The Panda's Thumb'; it originated from the inferiority of one of the Panda's thumbs.

The Panda Principle has universal application

Once you have grasped the general idea you will begin to see that the Panda Principle operates everywhere.

One broad category of applications is in the marketing and sale of products. Cohen & Stewart in their book 'Collapse of Chaos' use the example of the QWERTY keyboard to demonstrate the Panda Principle. The claim is that the early acceptance of this keyboard throughout industry, coupled with an extensive training programmme of operatives, effectively prevented new keyboards getting a foothold in that lucrative market, even though they may have been better.

You will be able to think of many more examples of the Panda Principle operating in marketing, it's full of them.

Application of LP to refinery planning on a knife-edge

Another class of examples of the Panda Principle is found in the introduction of new working practices. The early introduction of linear programming into refinery planning was one such case.

Refinery planning for a single refinery using a desk calculating machine is not too arduous. The final balanced monthly plan can always be achieved by appropriately sizing the final stack-burn. Throughout the oil industry thousands of refinery engineers had learnt these techniques, and many were unwilling to change their non-linear method for one based upon linear procedures.

The in situ staff formed a powerful lobby within the refineries and it was several years before their resistance to the new methods was overcome. Even then the true value of the LP formulation was only realised when it was used to study multi-refinery problems using extreme point analysis.

The results of most operational research will cause a change in the way people work; a new distribution planning procedure, a new way of choosing service stations and many other new systems, will all find the Panda Principle operating against their introduction.

To conclude

The Panda Principle offers a way of:

- predicting the outcome of possible changes and preparing to deal with any expected resistance.
- studying aspects of restricted competition
- The black bears in the Glacier State Park have found their own survival niche. To protect themselves from bear-attack the walkers carry a can of anti-personnel spray! That's a fact worth knowing.

ERNEST FIELD

(Reprinted from OR Newsletter February 1999)

WHY MARKETING?

Consultants, in-house groups, academic Departments everyone in OR needs, now more than ever, to market their services. Dr. Aubrey Wilson, a leading expert explains how it's done.

Operational researchers, whether consultants, providers of in-house services or academics, will be facing increasing competition in their respective markets - the consultant and internal researcher hoping to acquire more loyal clients providing a flow of high quality work and academics, students and research grants. All the professions share a common disdain and dislike of marketing which they associate with selling (which it is not) and the strident aggressive techniques used by the consumer goods industry. But marketing does not have to be brash and intrusive, and it can be practised with the same sophistication and elegance that typifies the work of operational researchers.

Marketing is essentially a communication process – albeit a persuasive one which concentrates on the needs of the users and the benefits which the professional can deliver. Good, informative communication is particularly important for operational researchers since unlike law, accountancy, architecture and medicine for example, there is widespread ignorance or misunderstanding as to precisely what operational research comprises and the benefits it can deliver.

If an attempt is to be made to encapsulate marketing into a very short article then the following headings would apply.

- **sensing** needs – even those needs which the client cannot verbalise
- **communicating** the benefits which ensue from the use of operational research
- **satisfying** the needs through the delivery of high quality services at commensurate fees
- **monitoring** satisfaction

Bolted together these elements are the essential basis of marketing.

COMMUNICATION

The communication system can be easily explained. The potential client (internal or external or student) frequently starts in a state of complete or partial ignorance about operational research, what it is and what it does, about the provider and his or her skills, experience and qualifications and a myriad other things which influence the decision to adopt the service, to enrol for a course or fund research. The first task in marketing is to move the 'prospect' from a state of total or imperfect knowledge, that is *unawareness* and *awareness* of all the issues which will be of concern to them. However, awareness does not alone create clients. They have to understand what the service is and does and what benefits will be delivered. This is the *comprehension* stage. But even this understanding will not in itself generate clients. The would-be client has to see the *relevance* of the service to their particular needs. Without establishing relevance it is most unlikely the service will be purchased. Having achieved awareness and comprehension and relevance it might be thought that the communication task is complete. It is not. There must be *conviction* that the service as described will deliver the benefits on budget and on time. Then and only then will a decision to take up the service be made.

In marketing the law of gravity has been repealed. There is no natural process by which the client falls through the various layers of communication. They have to be drawn by good, informative and persuasive communication. At the disposal of the operational researcher are all the tools of marketing which include such obvious ones as selling, advertising and PR and a large number of less obvious, but highly effective methods, such as affinity marketing and reverse seminars.

There are however countervailing forces which are acting on the communication targets pushing them back towards the *unawareness* stage. Memory lapse is the most obvious one but of equal importance among corporate clients is what is termed 'market attrition'. This is where decision makers change for a variety of reasons and the new decision makers may not know the service or its suppliers and thus float back up to the state of unawareness. There can be a loss of confidence in the service and/or its supplier. All this can be illustrated.

That is the communication process but it is not the message which is to be conveyed. **Benefits** is the key word. No one exchanges money for goods or services without expecting a benefit beyond the value of the monies paid. It is the task of the operational researcher to communicate and demonstrate the benefits that can be derived from the appropriate use of operational research.

Substantially, but not wholly, the marketing message must concentrate on explaining the advantages to the purchaser of the service. It is a paradox, but nonetheless true, that all too frequently what the operational researcher offers is not what the client purchases. This can be illustrated by examples.

Examples

What is offered *(Features)*	**What is sought or bought** *(Benefits)*
Inventory modelling	Lower investment in stock
Decision analysis	Risk reduction
Optimisation techniques	Reduced operating costs
Maintenance planning	Less down time
Simulation	Improved strategic DM
Financial modelling	Greater profitability
Data envelopment analysis	Improved efficiency
Training services	Increased employability

Typically – and this is true of all professions – 'features' tend to outnumber 'benefits' by a factor of seven. The reverse should be true. Literature produced by consultants, in-house departments and faculties most frequently show a heavy emphasis on the left hand list which are 'features' (of the service) rather than the right hand column which are 'benefits' (to the client). If all marketing literature is analysed and every feature underlined in one colour and every benefit in another it will quickly highlight any imbalance. The client is looking for benefits and, in a sense, is not over concerned with features. If he or she can obtain a maintenance planning service from a facilities management company or financial modelling from an accountant they will be just as satisfied. The marketing task is to show how operational research will yield greater and more cost effective benefits.

THE INTERNAL DEPARTMENT

The internal department providing services for its own organisation is increasingly under threat from out-sourcing and compulsory competitive tendering. Relationships between many internal service departments and their clients are all too frequently typified by adversarial attitudes rather than being part of the same team.

To introduce successful internal marketing requires more than a change of emphasis; a substantial change of attitude is needed. Psychologically, the removal of corporate protection – in the sense that clients had to use internal services or, at the very least, give them every opportunity to compete with external suppliers – and the creation of a situation in which, in many cases, the internal clients does not even have to short-list the in-house supplier, is proving cathartic. Neither attitudes nor values are changed overnight. New criteria exist for assessing managers' performance which were never previously part of the job specification, and were certainly never considered in the individual's career agenda. Operational Research Managers who pride themselves on the skills with which they practise their discipline now have to add marketing skills and, more important and much more difficult to achieve, marketing motivation.

The new task is to develop close working relationships based on a genuine mutual interest. Adversarial patterns of the past have to be broken. Negotiating skills are badly needed – something few managers of service departments have been taught. After all, when the use of a service is compulsory, price, quality or the way in which it is delivered is irrelevant. Improved co-ordination is required, which involves more than just the personnel actually delivering the service. It extends to the most junior member of the unit. Everyone has to be client-centered.

To match commercial offerings, more and better a backup services must be provided. While the core service may remain unaltered, the internal client will be demanding those additional facilities which are on offer from external suppliers. Optimum follow-up will be necessary. The inertia of the compulsory use system will certainly leave an attitude of "They know where we are if they want us". This cannot succeed in the face of the alternatives now open to client departments.

Just because the client is internal it does not mean (though it is often unwisely assumed) that all the information required about them is known or is obtainable. Neither proposition is wholly true now, let alone in the future. Better intelligence means fewer missed opportunities, better client liaison and attitudes. The techniques of marketing are just as applicable to the internal department as to external consultants.

Marketing is no longer an optional extra for consultants (who still rely heavily on the interpersonal network or referrals for business) in-house departments or educational and training establishments. It is an absolute necessity if all three strands of operational research are to build on their present successes.

EDUCATION AND TRAINING

The problem of marketing is perhaps greater for educational establishments and their faculties than it is for consultants and in-house managers. Marketing is even further divorced from academic activities than it is from the practitioner's work. The lack of understanding of OR in commerce and industry is unfortunately matched by a similar ignorance among potential students and their career advisors. The battle for research grants, scholarships and bursaries from limited funds is intense, particularly with competition for what are perceived as more 'glamorous' degree courses and research areas.

The Emersonian axiom about the world beating a path to the door of the better mousetrap maker is a philosophy for more leisurely and less competitive times. The task is for those seeking students and research funding to communicate in persuasive form. OR is indeed the better mousetrap and it offers substantial career and commercial rewards. OR may not guarantee a successful student employment for life, but it will deliver life time employable skills. This is the crux of the message and the tools for delivering it are ready and available.

Thus for the last year of this century and into the next one marketing will have to be as much a part of the OR manager's or teacher's skills and activities and job specification as the basic discipline that they practise. It is a well known cliché that if you do not market, something terrible happens – nothing!

DR. AUBREY WILSON

(Reprinted from OR Newsletter February 1999)

HUGH BARR

Hugh has had an accident on Ruapehu and he is now at the Spinal Injuries Unit, Burwood Hospital, Private Bag 4708, Christchurch. Our thoughts are with you Hugh.

MEEETINGS CALENDAR FOR 1999 AND BEYOND

10th Mini Euro Conference, HCP'99, 20 – 24 September 1999, Brest, France
Contact: Ghislaine Le Gall, Departement IASC, ENST Bretagne, BP 832, 29285, Brest cedex–France. Tel 33 2 9800 1425 Facsimile: 33 2 9800 1030
e mail:Ghislaine.LeGall@enst-bretagne.fr or http://www.iasc.enst-bretagne.fr/hcp99/

26th International Conference on Computers and Industrial Engineering, 8 – 10 December 1999, Melbourne, Australia
Contact: Paul Lochert, Monash University, PO Box 197, Caulfield East, Vic 3145, Australia Tel: 61 3 9903 2647 Facsimile: 61 3 9903 2227
e mail: p.lochert@sci.monash.edu.au

34th Annual Conference of the Operational Research Society of New Zealand. 10 - 11th December 1999, Waikato University, Hamilton, New Zealand
Closing date for full paper submissions - 27 October 1999.
Contact: John Scott, email:jls@waikato.ac.nz or email:orsnz99@waikato.ac.nz

Western Decision Sciences Institute 29th Annual General Meeting, 18 - 22 April, 2000, Ritz Carlton Hotel, Kapalua, Island of Maui, Hawaii Contact: Miles Nicholls, email:mnicholls@swin.edu.au or website:http://misnt.calpoly.edu/wdsi

2nd International ICSC Symposium on Neural Computation, 23 – 26 May. 2000, Technical University of Berlin, Germany
Submission of papers – 31 October 1999
Contact: Symposium organiser, email:icsc@icsc.ch or website:http//www.icsc.ab.ca

INFORMS-KORMS International Conference, 18 - 21 June 2000, Seoul, Korea.
Contact: Professor Sang Hyung Ahn, email:shahn@snu.ac.kr

Fifth Conference of the Asian-Pacific Operations Research Societies within IFORS(APORS' 2000), 5 – 7 July, 2000, Singapore.
Details on http:www.comp.nus.edu.sg/~phuakh/apors
Contact: Programme chair, Pual KH Phua, email:phuakh@comp.nus.edu.sg

Matrix Analytic Methods Conference, 12 - 14 July 2000, Leuven, Belgium.
Contact: Peter Taylor, email:ptaylor@maths.adelaide.edu.au or Malcolm Faddy, email: M.Faddy@math.canterbury.ac.nz