

EDITORIAL

Although this is the December 2007 edition of the newsletter, due to an inevitable delay, it will be February 2008 when you read it. The recent festivities are all forgotten and I'm sure, wherever you are, work pressures are keeping you busy. We are again proud to bring you this newsletter which is the third one since its inception – it has been a pleasure to prepare the newsletter and I can hardly believe that time goes by so fast that we already have its third edition.

The newsletter is only available electronically and as with the previous one we sent it to a representative of all member societies of IFORS with the request that the particular representative, in turn, sends it to all the respective society members. There is no way to check whether this has in fact happened but this will be the mechanism of getting the newsletter to all those associated with IFORS. The newsletter is also available on the IFORS website at www.ifors.org

In this edition we have a variety of news items, short articles reminiscent of past conferences, conference announcements as well as a feature article and more. Firstly, let me thank those who contributed to this newsletter. Without contributions like these we cannot have a newsletter. In this regard I find it so pleasing that in the majority of cases when I approach someone to contribute something there is no hesitation – sometimes, I know, within a very heavy work schedule. Thanks again to those who contributed to this edition.

With the 18th triennial IFORS conference, to be held in South Africa, around the corner it is much appropriate to have the IFORS executive member responsible for meetings write a piece on what we can expect at the conference. This also serves as a strong invitation to join us at the conference in July

2008! Two previous presidents of IFORS, Heiner Muller-Merbach and Brian Haley, have each written short articles about IFORS conferences. In Brian's case he is possibly one of a few people who are still alive that attended the 1st IFORS conference in Oxford in 1957.

In this newsletter we welcome the new IFORS VP for EURO, Prof. M. Grazia Speranza, an impressive lady from Italy. IFORS consists of regional groupings as well as member societies from many different countries. As a follow-up on the article on ALIO in the September 2007 edition there is a short article on the OR society of Denmark, a small but seemingly fairly active society with a very professional newsletter.

Heiner Muller-Merbach features again with an article he calls "Hidden Gems in OR", which makes for fascinating reading. The feature article is on "OR and Banking" written by Prof. Paul Fatti of South Africa. Paul has had a very long involvement with banking which is very clear from his article. I am continuously amazed at where OR is used and how operations researchers have almost entrenched the use of our discipline in many different domains. Two conference announcements are included, one that will take place in Iran and the other in Argentina. Enjoy!

Finally, I would like to use this opportunity to extend my own invitation to all those associated with IFORS to come and join us at the next IFORS conference here in South Africa. With the 50th celebrations of IFORS and with a great programme being put together under the able guidance of John Bartholdi this should be a wonderful conference.

Hans W Ittmann
Newsletter Editor

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IFORS 50TH ANNIVERSARY, AND COMMUNITY

Sandton, South Africa. July 13-18, 2008

In July, the international operational research community will meet in Sandton, South Africa, at the 18th Triennial Conference of the International Federation of Operational Research Societies. Community is a key word for a few reasons. First, the theme of the conference is *Operational Research: developing communities, managing the connections amongst them*, stressing the broader effect of operational research.

Often, we think of operational research in narrow terms. How can this manufacturing operation be done more effectively? How can we ship our goods more cheaply? What is the right product mix we should keep in our stores? But operational research can have a much broader effect on community, particularly for those living in the developing world. How can we provide medical care to the

poorest of our community? How can the effects of information technology be used in all schools, not just rich ones? How does the global economic system affect agriculture, mining, and other primary resource extraction economies? This theme is important for our field, and particularly relevant for IFORS' first triennial conference in Africa.

The conference also represents the coming together of an international group of researchers and practitioners. As I write this in January, more than 800 abstracts have been submitted for this conference. The abstracts represent the incredible breadth of our field, from the fundamental mathematics of optimization, to the practical, immediate use of OR methods in practice. And that practice ranges from manufacturing to distribution to medical care to humanitarian logistics, to give just a few examples. By coming together, the international community of operational researchers reconnect and recognize their common interests.

Creating and strengthening this community has always been a big part of IFORS conferences. It is no coincidence that IFORS conferences always has a group outing on Wednesday, an activity uncommon for conferences our size. That outing is not just an opportunity to visit some of the fascinating sites near the conference (though they are particularly wonderful in this case: more on that later) but it is an opportunity to connect with those with common interests. I would love to know how many papers were written and how many problems were solved due to spontaneous conversations during IFORS' outings. I would bet the number is quite large. If you value social capital, the value we gain from interacting with others, then the structure of an IFORS conference is ideal: our goal is to



IFORS 50TH ANNIVERSARY, AND COMMUNITY

Let those who might live ten thousand miles apart learn from each other, and interact. In short, our goal is to build a community of those in OR.

This conference has one other type of community: a community over time. This conference occurs during IFORS' 50th anniversary year. During the conference, there will be pictures, stories, and celebrations of IFORS history, and discussion of its future. Be sure to check www.ifors.org for updates on the 50th Anniversary plans.

A word about our venue: in my role as "meetings coordinator" for the IFORS Administrative Committee, I, along with the rest of the AC, visited Sandton two years ago to visit the convention center, hotels, and

possible outing locations. The convention center is perfect for a conference our size. New and modern, the facilities are outstanding, and it looks like we will get all, or nearly all, sessions under one roof. The hotels in the area are first rate, and the eating and shopping possibilities are absolutely first-rate. Even without leaving the Sandton area (a suburb of Johannesburg), you will have a wonderful and varied time. But during the Wednesday outing and perhaps before or after the conference, you will have a chance to see sites in the area. Whether it is seeing the "Big Five" in a game park, or visiting the Cradle of Human Kind (a World Heritage Site consisting of caves containing fossils from some of the earliest of human ancestors), or (for those interested in a more "professional" outing), a visit to

a diamond mine, you will see things that you cannot see anywhere else in the world. During our visit, I found our visit to Soweto seeing the homes of Nelson Mandela and Archbishop Tutu particularly moving. I am not sure what I expected to find in South Africa, but I found a dynamic, exciting, vibrant area, with far more to offer than your standard conference location.

I am very much looking forward to IFORS 2008 and the celebration of 50 years of IFORS. I hope to see you in Sandton!

Mike Trick

Vice-President, IFORS

NEW MEMBER OF THE IFORS COMMITTEE



IFORS Vice-President for Association of European Operational Research Societies within IFORS (EURO)

Prof. M. Grazia Speranza

Prof. Grazia Speranza is Professor of Operations Research at the University of Brescia, Italy. She is currently Vice-President of the IFORS, representing EURO. She graduated in Mathematics and received her PhD in Applied Mathematics in 1983 at the University of Milan. She has been President of the Research Council and Vice-President of the University of Brescia (Italy), and is at present Dean of the Faculty of Economics and Business.

Her main scientific interests are optimization models and algorithms for transportation and logistics, scheduling, combinatorial optimization. She has published more than 100 refereed papers on these topics which appeared on international journals and volumes. She has also edited international volumes and special issues of journals.

She serves as Area Editor for Logistics, Distribution, Inventory and Transportation of the Asia-Pacific Journal of Operational Research and as Associate Editor of Transportation Science. She has served as Associate Editor of Transportation Research. She has organized international conferences, such as the first workshop on "Models and algorithms for planning and scheduling problems (MAPSP)" in Como (Italy) in 1993, "Odysseus" in Palermo (Italy) in 2003, "TRISTAN IV" in the Azores Islands (Portugal) in 2004, the "International Workshop on Distribution Logistics" in Brescia in 1998 and 2007. She has been member of the Scientific Committee and invited speaker at several international conferences.



The Danish Operations Research Society (DORS) was founded in 1962 at the beautiful conference center "Rolighed" as a consequence of the First International Conference on Operational Research in Oxford in 1957. DORS is the only

Airlines. Another category of DORS meetings encompasses optimization software seminars. Every second year DORS and Ilog organize a seminar for presenting latest development within Ilog

IFORS MEMBER SOCIETY: THE DANISH OPERATIONAL RESEARCH SOCIETY (DORS)

professional society for operations researchers in academia and industry in Denmark. Today there are approximately 200 members in DORS, including students, regular members, academic departments and private companies. Almost all Danish university departments which are active in the field of OR, are members of DORS. Company members are mainly within the transportation industry, energy and optimization software. Today the society has two honorary members, both among the founders of DORS: Arne Jensen, "the father" of operations research in Denmark, who was the first chairman of DORS' board and Erik Johnsen, who among other achievements wrote the first OR book in Danish back in 1962.

The main focus of the society is to establish a close cooperation between the academia, industry and government. DORS tries to emphasize the importance of practical applications in OR and is therefore not an entirely academic society. The board of DORS has worked actively to implement the strategy of building a bridge between theory and practice in OR over the last 10-15 years. The majority of all organized meetings are therefore of practical interest within operations research. The development and dissemination of the theoretical aspects of OR are left to universities.

DORS organizes 6-8 meetings of different categories on a yearly basis and sponsors even more activities. An annual career meeting takes place in fall and is targeted to graduating OR students. During this event, three or four companies with an interest within OR present themselves and typical career possibilities for OR graduates within the company. During the latest career meeting in 2007 we invited presenters from DONG Energy Markets, Scandinavian Airlines Revenue Management Development and Danish State Railways Planning Department.

DORS organizes company visits which take place once or twice a year. In recent years there have been among others company visits to the Danish State Railways, the Postal Service in Denmark, PA Consulting, Jeppesen Systems and Scandinavian

optimization software products. Other meetings in the same category have focused on GAMS, Mosel and Mosek Optimization Software. Meetings usually attract from 15 to 40 participants. Depending on the topic, some of the participants are not even DORS members, but students and professionals interested in the topic of the meeting. The mission of the DORS board is to attract at least 30 participants to all meetings organized by DORS, but occasionally timing and/or insufficient promotion cause lower participation. As a small society we do not have annual national meetings. Instead we actively support the Nordic Optimization Symposium, a meeting of the Nordic Section of the Mathematical Programming Society, which attracts a large number of participants from all Nordic countries.

The DORS newsletter is called ORbit and is published three times a year with a circulation of around 280. It contains 24-36 pages printed in full color with short papers on applications, surveys and conference reports. The paper standards mainly fit our mission of bringing academia and industry within OR closer together and are therefore focused on practical applications within operations research in Denmark. Papers are mainly written in Danish, but English and other Nordic languages are also accepted as they can be read by the Danish audience. We think ORbit has a quite high standard both in terms of contents as well as the layout, although the relatively low circulation makes it difficult to provide the newsletter at a reasonable unit cost.

Like any small society, DORS faces its challenges. Most of DORS' activities take place within the Greater Copenhagen area. Even though efforts are put to spread our activities throughout the country, it has proven to be extremely difficult to reach the same level of activities outside Copenhagen. Another challenge has been to incorporate other OR topics than the traditional stronghold of optimization in transportation within DORS. Due to a limited number of active OR practitioners in Denmark it is not always easy to attract written contributions to the newsletter.



The DORS homepage on www.dorsnet.dk provides information on DORS activities as well as information about operations research in Danish. The traffic on the website is not very high and it is not frequently used by most members. The board

has since mid 2007 been in the process of setting guidelines for a major update of the website and afterward appointing a dedicated webmaster. The aim is to improve contents and use of dorsnet.dk.

Most communication to the members is done via email. DORS' mailing list is used to promote activities, inform about job openings in company members etc. Other promotion is facilitated by university professors who announce DORS meetings to the students with posters and overhead slides.

All activities of DORS are funded by a 14.000 EUR annual budget almost exclusively raised from membership fees: 9 EUR yearly fee for student members, 35 EUR fee for regular members, 250 EUR yearly fee for academic departments and 450 EUR for company members.

DORS is run by a board of 8 members. The board members are elected for a two years term, four members each year. The typical board member is a Ph.D. student, a younger professor or a younger OR professional in industry. This is very unlike in the beginning of the society, where the board was dominated by senior professors and only a few industry people. But like in many small associations and societies the recruitment is weak and the board turnover is limited with members serving at least for four years, typically longer. In fact in the early 90's there was a proposal to dissolve the society at a general assembly. Fortunately, this proposal was rejected and since then DORS has experienced a slow but steady growth.

We believe DORS as a small society has found the right strategy putting emphasis on bridging the gap between academia and industry. DORS will collaborate on an international basis in EURO and IFORS and among the Nordic societies to further the knowledge of OR.

Jesper Larsen, *Technical University of Denmark and Editor of Orbit, the DORS newsletter*



HIDDEN GEMS IN OR, NO. 1

Habr's Pre-Heuristic Data Preparation for the LP Transportation Problem

There are hidden gems in the early Proceedings of International Conferences of IFORS, IFIP (International Federation for Information Processing) etc., which are almost completely neglected since. E.g. Habr published a highly effective data preparation procedure for the LP transportation problem (which can also be applied to some other problems such as the "travelling salesman problem"). It was published in 1962, and almost nobody took notice of his idea (save for Müller-Merbach 1963). It shall be outlined here in its basic structure and slightly extended.

Considered is the LP transportation problem in its standard form, such as:

$$\begin{aligned} \text{Min } C &= \sum_i \sum_j c_{ij} x_{ij} & (1a) \\ \text{s.t. } \sum_j x_{ij} &= a_i \quad \forall i (1, 2, \dots, m) & (1b) \\ \sum_i x_{ij} &= b_j \quad \forall j (1, 2, \dots, n) & (1c) \\ x_{ij} &\geq 0 \quad \forall ij & (1d) \end{aligned}$$

In order to solve cases of the LP transportation problem, standard computer codes are available today. They consist of an iterative procedure. Prior to the iterations, an initial solution is produced by a heuristic. Several heuristics are suggested in the literature and tested by means of numerical examples. The closer an initial solution is to the optimal solution, the less number of iterations is expected to find the optimal solution.

Habr's idea was to apply a data preparation procedure prior to the heuristic. It will be demonstrated by the following example (Table 1).

	j=1	j=2	j=3	j=4	a _i
i=1	10	22	9	15	4
i=2	9	20	10	23	6
i=3	4	10	16	14	3
b _j	3	2	3	5	13

Table 1: 3x4 example of the LP transportation problem with a_i (final column), b_j (final row), c_{ij} (cost matrix), and the transportation quantities x_{ij} of an initial solution (bold, italics)

The example has m=3 supply sources i with the supply quantities a_i, and n=4 demand destinations j with the demand quantities b_j.

The initial solution, i.e. the x_{ij}, is generated here with the "matrix scan" or "matrix minimum" heuristic, one of the many heuristics available. It searches for the minimal c_{ij} of the (remaining) matrix and assigns the maximal possible transportation quantity to this ij-combination. In this case, the matrix scan heuristic leads to the mediocre solution: x₃₁=3, x₁₃=3, x₃₂=0, x₁₄=1, x₂₂=2, and x₂₄=4 (Table 1) with the total costs of C = 186.

The idea of Habr is to relate any single cost element c_{ij} to all the other cost elements and suggests an overall two-pair alternative relation: the alternative of any x_{ij} = 1 and any x_{pq} = 1 would be x_{iq} = 1 and x_{pj} = 1. Habr sums up all the corresponding cost differences, i.e. (c_{ij} + c_{pq}) minus (c_{iq} + c_{pj}), adding up to

$$\begin{aligned} \text{dij} &= \sum_p \sum_q (c_{ij} - c_{iq} - c_{pj} + c_{pq}) & (2a) \\ &= m \cdot n \cdot c_{ij} - m \sum_q c_{iq} - n \sum_p c_{pj} + \sum_p \sum_q c_{pq} & (2b) \end{aligned}$$

In our example, the c_{ij} (Table 1) are now replaced by the dij (Table 2). The "matrix scan" or "matrix minimum" heuristic leads to a quite different (and much better) initial solution selected according to the dij values: x₃₂ = 2, x₂₃ = 3, x₁₄ = 4, x₃₁ = 1, x₂₁ = 2, and x₂₄ = 1 (Table 2) with the total costs of C = 155.

	j=1	j=2	j=3	j=4	a _i
i=1	22	50	-38	-34	4
i=2	-8	8	-44	44	6
i=3	-14	-58	82	-10	3
b _j	3	2	3	5	13

Table 2: 3x4 example of the LP transportation problem with a_i (final column), b_j (final row), dij (cost matrix after preparation according to Habr), and the transportation quantities x_{ij} of an initial solution (bold, italics)

It should be observed that the dij of any row and of any column add up to 0: $\sum_i \text{dij} = 0 \quad \forall j$ and $\sum_j \text{dij} = 0 \quad \forall i$.

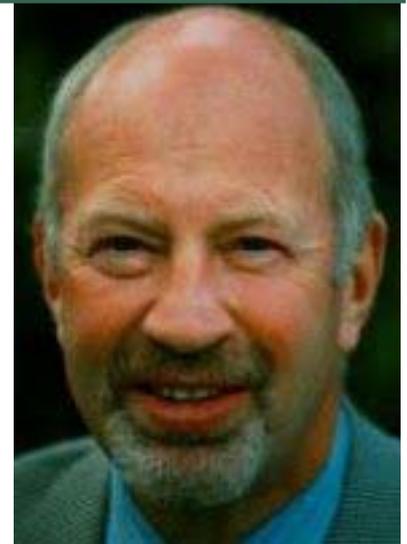
Habr's data preparation can be extended in that the quantity constants a_i and b_j, respectively, are used as weights of the rows and columns. The dij would then, using s = $\sum_i a_i = \sum_j b_j$, be replaced by g_{ij} with:

$$\begin{aligned} \text{gij} &= \sum_p \sum_q (a_i b_j c_{ij} - a_i b_q c_{iq} - a_p b_j c_{pj} + a_p b_q c_{pq}) & (3a) \\ &= s^2 c_{ij} - s \sum_q b_q c_{iq} - s \sum_p a_p c_{pj} + \sum_p \sum_q a_p b_q c_{pq} & (3b) \end{aligned}$$

In our example, the c_{ij} (Table 1) are now replaced by the g_{ij} (Table 3). The "matrix scan" or "matrix minimum" heuristic leads to the optimal solution selected according to the g_{ij} values: x₃₂ = 2, x₂₃ = 3, x₁₄ = 4, x₃₄ = 1, x₃₁ = 0, and x₂₁ = 3 (Table 3) with the total costs of C = 151.

It should be observed that the g_{ij} of a column, multiplied by a_i, add up to 0; the same holds for the g_{ij} of a row, multiplied by b_j: $\sum_i a_i g_{ij} = 0 \quad \forall j$ and $\sum_j b_j g_{ij} = 0 \quad \forall i$.

Habr's data preparation procedure (eq. 2b) as well as the advanced data preparation procedure (eq.



	j=1	j=2	j=3	j=4	a _i
i=1	450	762	-213	-447	4
i=2	-187	-44	-512	437	6
i=3	-226	-928	1308	-278	3
b _j	3	2	3	5	13

Table 3: 3x4 example of the LP transportation problem with a_i (final column), b_j (final row), g_{ij} (cost matrix after "advanced" preparation), and the transportation quantities x_{ij} of an initial solution (bold, italics)

3b) are very rapid and require only m*n operations. The improvement of the initial solution, measured by the reduction of iterations, is remarkable – even if it varies with the data structure of the case. Both data preparation procedures are particularly effective in combination with the matrix scan heuristic. Since this heuristic is a rather time-consuming one, it can also be replaced by other heuristics – even if the quality of the initial solution will be slightly less advantageous.

Even if the professional computer codes for the LP transportation problem available today are extremely powerful, pre-heuristic data preparation would add to the power of the codes.

Similar data preparation procedures can easily be applied to other problem types, such as the "travelling salesman problem" or the "quadratic assignment problem".

References:

- Habr, J.: The Use of Approximation Methods in Linear Programming, in: Proceedings of the IFIP Congress 62, Amsterdam 1962, pp. 80-82.
- Müller-Merbach, Heiner: Verschiedene Näherungsverfahren zur Lösung des Transportproblems, in: IBM Fachbibliothek 1963, IBM Form 78106.

Heiner Müller-Merbach., University Kaiserslautern, IFORS President 1983 to 1985



MEMORIES OF THE FIRST INTERNATIONAL CONFERENCE ON OR

In September 1956 the Operational Research Society, United Kingdom, the Operations Research Society of America and The Institute of Management Sciences, U.S.A. issued an invitation to submit, within two months, abstracts of papers to be presented at an International Conference which was to be held at the University of Oxford from 2nd to 7th September 1957. The objective of this first meeting was to "Unify and extend the Science of O.R." As a research student I had just completed a study into the transportation of Coal for the U.K. Central Electricity Authority working with John Stringer from that organisation and we submitted a joint paper which was accepted. The O.R.Society offered to subsidise two students at the conference and as a result I was able to afford to attend the meeting at a cost of £10 which included all meals and accommodation.

The conference was organised at a time when there were 3 major publications viz "the Operational Research Quarterly"; "Journal of the Operations Research Society of America" and "Management Science". Other articles on O.R. appeared in the Statistics and Economics journals. There were no books on O.R. Techniques although some reports of one and two day local meetings had appeared in volume form. Education offerings were confined to short courses offered in the U.K. and America and the course at the Case Institute of Technology was to inspire the text book by Churchman, Ackoff and Arnoff (all three were in Oxford) which appeared early in 1957. Masters Courses were available within a year in the U.K. and the U.S.A..

Copies of most of the 29 papers were circulated before the event and some 250 delegates from 21 countries (including 80 U.K. 60 USA 25 France) assembled on Monday morning for the start of a meeting that helped fashion the development of OR worldwide. It became apparent in the first

session that most of the founding fathers of the subject were present and would be taking part in all the events.

B.O.Koopman, T.C.Koopmans, S.Beer, M.M.Flood, P.M. Morse, C.F. Goodeve, J.H.Engel, D.B.Hertz, B.H.P.Rivett, H.Miser, G.Kreweras, R.M.Oliver H.P.Galliher, R.L.Ackoff, E.L.Arnoff, C.W.Churchman, G. B.Dantzig

The conference was probably the last time when it was possible for most delegates to be aware of most of the applications and understand the intricacies of the techniques which were described.

All papers were presented in a plenary form in a slightly banked lecture theatre and it was assumed that they had been read before the meeting so presentation could be supplemented by the latest findings. It was however somewhat awe-inspiring to find that although I was the youngest delegate I was speaking in a session chaired by Thornton Page and my paper was preceded by one given by George B. Dantzig and there was no escape for the audience.

The subjects discussed will be familiar to present conference goers and included the Philosophy of OR; problems of decision making; Applications of queuing theory, linear programming and stock control, development of techniques statistical methods. There was very little access to any electronic computers and most calculations were carried out using electric calculators and as a result there were several physical analogue models proposed and their results illustrated. In particular these were used for depot location, linear programming, and as a generator of random information for simulation models. One afternoon was devoted to panel meetings the subjects of which included: Education and Training; Communication of O.R.Results; Organisation of O.R. Groups; Forecasting Future needs

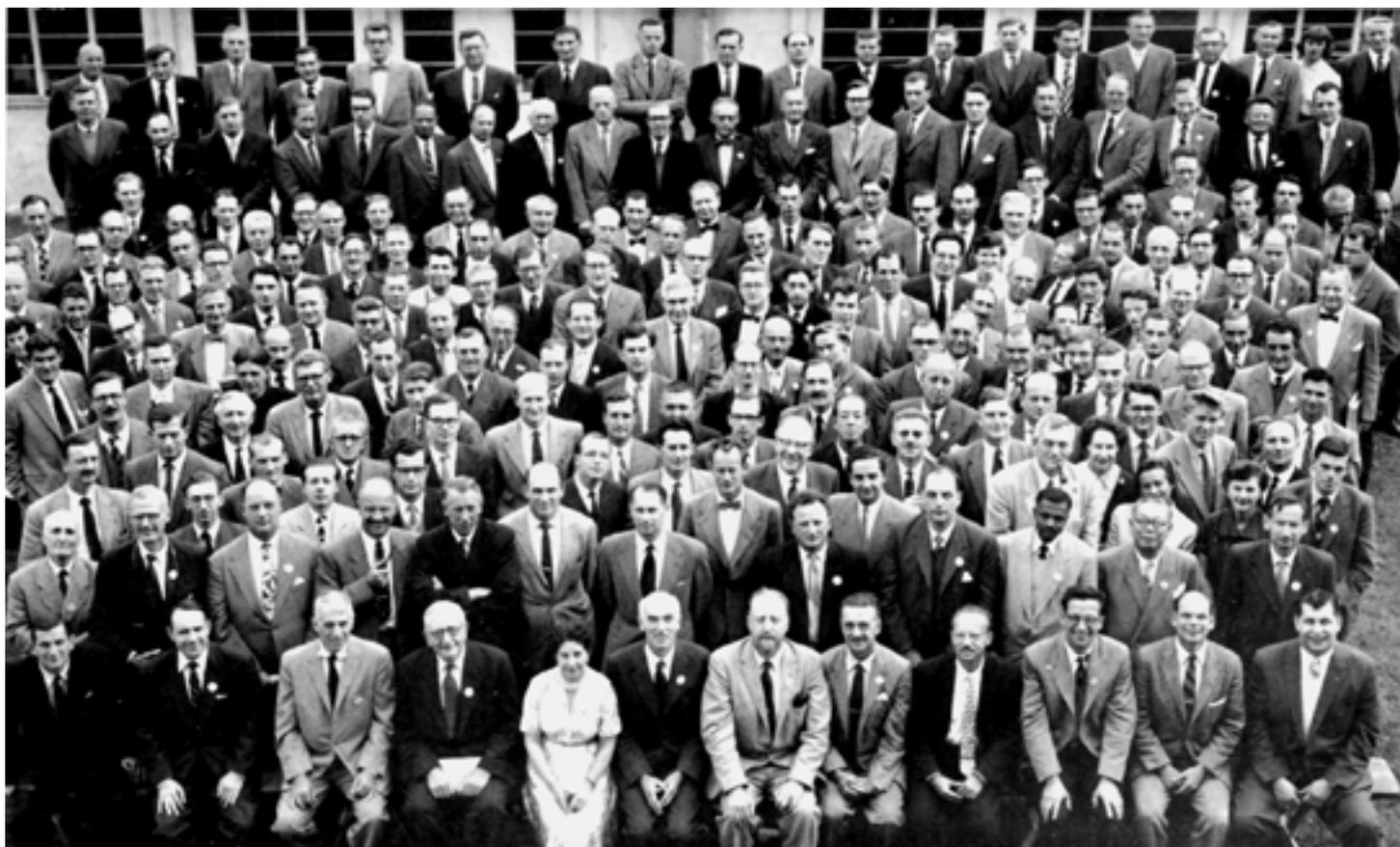
and Techniques and a second afternoon to reports from some 16 delegates on the state of O.R. in their respective countries.

Socially the conference organisers provided facilities for the delegates to get to know each other not only by ensuring that the conference fee included all meals and therefore meant that the delegates were able to dine with those staying in the same hall but also providing a conference dinner on the first evening and a visit to The Shakespeare Memorial Theatre in Stratford on Avon on the Wednesday. The master stroke however was arranging for some ten delegates to be allocated rather more spacious rooms in which they could hold informal discussion groups. Each delegate was allocated to one host and on arrival it turned out that there was a generous supply of liquid refreshment to assist in the discussion. Not every group was fully attended and as the evening progressed parties amalgamated with smaller ones joining the larger carrying with them bottles and crates. The inventory control was meticulous because there was a sufficient stock available for the discussion groups to continue on the Thursday and took the form of farewell parties which saw some minor damage caused by individuals dancing on tables and a corresponding charge on the conference expenses.

The final day saw the conference divide to visit O.R. Activities spread throughout the U.K. and so this last evening included a clear desire to meet again as soon as possible and despite the damage costs the conference showed a healthy profit which the organiser decreed should be used for another meeting to be held in three years time. Various other activities and uses of the profits were proposed and would be implemented during 1958 when IFORS was conceived.

K.Brian Haley, *United Kingdom*
Vice-President of IFORS 1983 to 1985 and
IFORS President 1992 to 1994.





THE FIRST OR CONFERENCE OXFORD, SEPTEMBER 1957

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| 21 L. J. Govier | 66 C. Berline | 103 D. G. R. Bonnell | 144 W. A. Johnson | 188 Miss J. Dinnison |
| 23 W. Monhemius | 68 R. A. Leaver | 104 A. W. Swan | 145 Edward D. van Rest | 189 A. van Kreveld |
| 25 Louis P. Clark | 69 O. Swensson | 105 Elio M. Ventura | 146 J. R. M. Wanty | 190 Robert M. Oliver |
| 26 Guy Bitterlin | 70 Edward L. Brink | 106 Robert H. Roy | 149 W. E. Duckworth | 191 Roger Crane |
| 27 P. Salmon | 72 John S. de Cani | 107 George J. Feeney | 150 W. E. Cushen | 192 Bernard O. Koopman |
| 30 Jan Sittig | 73 T. E. Easterfield | 108 F. J. Toft | 151 J. L. Venn | 193 William Slater |
| 31 LeRoy A. Brothers | 74 Clayton J. Thomas | 109 M. A. Simpson | 152 R. W. Watkins | 194 Miss B. E. Kornitzer |
| 32 Georges Brigham | 75 E. O. Berdahl | 110 E. D. J. Stewart | 153 Arne Sjöberg | 195 Charles F. Goodeve |
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| 34 H. E. Nissen | 77 J. K. W. Slater | 114 Mlle. N. Tabard | 156 J. Stringer | 197 Philip M. Morse |
| 35 R. W. Bevan | 78 Gordon Norton | 115 J. G. Wardrop | 157 Eric Rhenman | 198 George B. Dantzig |
| 36 A. P. MacD. Purdon | 79 A. H. Schaafsma | 117 Hugh J. Miser | 159 S. P. Rose | 199 B. H. P. Rivett |
| 37 B. D. Hankin | 80 Gunnar Dannerstedt | 119 J. J. Wiedmann | 161 Donald Hicks | 200 David Bendel Hertz |
| 38 G. B. Bernard | 81 Lars Erik Zachrisson | 120 J. Pfanagl | 163 T. I. McLoughlin | 201 E. Leonard Arnoff |
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Cooperation among “Sister Federations”: The Heritage of FIACC

In 1970, the “Five International Associations Coordinating Committee” (FIACC) was founded.

The member Associations, sometimes called “Sister Federations”, are:

- **IFAC**
International Federation of Automatic Control
- **IFIP**
The International Federation for Information Processing
- **IFORS**
International Federation of Operational Research Societies
- **IMACS**
International Association for Mathematics and Computers in Simulation
- **IMEKO**
International Measurement Confederation

Those fields of technology are represented by these five Federations that coin contemporary and future machinery. They include measurement, information processing, automatic control, optimisation, and simulation. Take, for example, any transportation system (such as cars, trains, ships, airplanes, including all the support systems), energy production, supply and

consumption, any production plant or any other kind of machinery. Save for new materials, it is measurement, information processing, automatic control, optimisation, and simulation, which make the difference between contemporary machinery and the machinery of earlier generations.

Therefore, it was quite wise and future-oriented to found an institution such as FIACC.

FIACC served the purpose of closer cooperation among the Sister Federations. This was particularly accomplished by co-sponsoring conferences and symposia. During the early years of FIACC, the Sister Federations met once a year, each one represented by up to three delegates, in many cases by the President and the Secretary.

Later on, the cooperation became more and more a routine business. Therefore, official personal meetings of delegations were no longer necessary. Instead, the Secretaries of the Federations and their staff carry out most of the cooperation.

“Objectives and Working Principles” of FIACC were approved in June 1978, and included nine rules. The first three rules read:

1. “FIACC was established to perform purely advisory functions and all its

activities shall consist in information and recommendations to its constituent Associations and to outside Bodies.

2. The coordinating function of FIACC shall be limited to the public activities of the constituent Associations, such as: congresses, symposia, colloquia, seminars and publications.
3. That coordination shall primarily be attained through oral and written exchange of information at and between meetings of FIACC based on informative data received from the constituent Associations.”

Even if no FIACC meeting has been taking place for some 15 years, the spirit of cooperation continues at Secretary level, and a variety of symposia etc. continues to be co-sponsored by the respective FIACC Associations.

Heiner Müller-Merbach, *Universität Kaiserslautern, Germany*
(*Past-President of IFORS 1983/85, and Past-Chairman of FIACC 1985/86*)

Helle Welling
(*Secretary of IFORS 1976/98*)



Travelling the IFORS Tour

The first International Conference of Operational Research took place in Oxford (UK) in the first week of September, 1957, i.e. 50 years ago. An encouraging report was published in *The Economist* on 7th September, 1957. This first Conference was the prelude for the foundation of IFORS and its series of triennial international conferences (Table).

Nine of the 18 international conferences took place in Europe, six in America, two in Asia, and no. 18 will take place at the new Sandton Conference Centre in Sandton near Johannesburg, South-Africa., 13th through 18th July, 2008.

The sequence of venues did not follow any algorithm, e.g. one of the many Travelling Salesman heuristics. Instead, the member societies of IFORS voted for the venue of the next conference each time. Thus, the "IFORS Tour" zigzags through the continents (map). The whole tour from Oxford to Johannesburg would take approximately 127,103 kilometres.

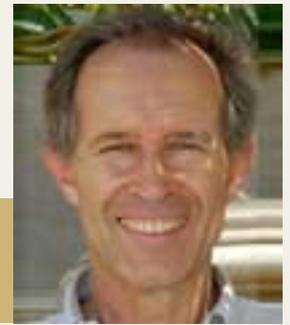
Were IFORS a Travelling Salesman (in the OR sense), the tour from Oxford to Johannesburg via the 16 other places would follow a sequence such as: Oxford – Edinburgh – Dublin – Lisbon – Aix-en-Provence – Venice – Athens – Hamburg – Oslo – Beijing – Tokyo/Kyoto – Hawaii – Vancouver – Toronto – Boston – Washington DC – Buenos Aires – Sandton and take only approximately 49,214 kilometres. This is just an advice for idle retired OR people who want to visit all the IFORS conference venues.

Heiner Müller-Merbach., *University Kaiserslautern, IFORS President 1983 to 1985*

No.	Year	Place	
1	1957	OXF:	Oxford, UK
2	1960	MRS:	Aix-en-Provence, France
3	1963	OSL:	Oslo, Norway
4	1966	BOS:	Boston, US
5	1969	VCE:	Venice, Italy
6	1972	DUB:	Dublin, Ireland
7	1975	TYO:	Tokyo/Kyoto, Japan
8	1978	YTO:	Toronto, Canada
9	1981	HAM:	Hamburg, Germany
10	1984	WAS:	Washington DC, US
11	1987	BUE:	Buenos Aires, Argentina
12	1990	ATH:	Athens, Greece
13	1993	LIS:	Lisbon, Portugal
14	1996	YVR:	Vancouver, Canada
15	1999	BJS:	Beijing, China
16	2002	EDI:	Edinburgh, UK
17	2005	HNL:	Hawaii, US
18	2008	JNB:	Sandton, South-Africa

Table: *International conferences on Operational Research, organised by IFORS*





OR AND BANKING

1. Introduction

The banking world is rich in applications of Operational Research, under which I include statistical applications. My first involvement in the area dates back to the early 1980s, when I was invited to consult for one of South Africa's big banks, and my involvement has continued intermittently since then.

Banking is one of the world's oldest industries. While banks' original functions of lending money and taking deposits are still possibly their most important, a host of other functions, such as the provision of financial services and trading in financial instruments, have been added to their repertoire.. Their customers range from individuals, through to businesses, corporations and government, and they play a big role in modern society. Traditionally bankers have been seen as conservative, rule-bound and resistant to change, but the pressures of modern technology, competition and the pace of change have forced banks to move and keep up. Modern banking, with credit- and debit cards, automatic teller machines and internet- and telephone banking is a far cry from 25 years ago, when branch-based banking was the norm for most customers. This article is based mostly on my own experience as a consultant to the banking industry, so, while it is fairly wide ranging, it does not cover the whole spectrum of "analytics" (as the use of OR and Statistics is referred to in this environment) in banking.

Applications of OR in banking will be considered under the following headings:

- Improving banking operations
- Planning
- Marketing (including customer relationship management), and the
- Financial area

2. Data

By its nature, banking is data-rich, since banks hold large volumes of information on their customers and on their banking transactions. This data can provide powerful insights into customers' banking behaviour, preferences and habits, which can be used both for monitoring their behaviour and for identifying opportunities for marketing products to them. In earlier days, this data typically resided on several separate, often incompatible databases, some of which were paper-based. As a result, data capturing and sorting out data issues usually took up a large proportion of an OR project's time. More recently, with the development of electronic data warehouses and the availability of powerful software for "mining" them, banks are increasingly using this information as a competitive tool. This, in turn, has facilitated the use of OR technology towards problem-solving and enhancing the efficiency and competitiveness of banks.

3. Banking Operations

From an operational perspective, banks share many similarities with industrial firms, and therefore many of the OR techniques applied in industry are also useful in this environment. I have been involved in a number OR applications in this area.

3.1 Cash management

In the handling and management of cash, banking shares many commonalities with industrial operations.

3.1.1 Cash replenishment at branches

A problem faced by the branch manager is to balance the requirement of having sufficient cash to satisfy the demand from customers with that of not paying for holding too much cash. This problem is typically treated as a periodic review inventory problem, with the manager deciding on a regular basis, usually daily in the cities but less frequently for rural branches, whether to place an order from the central cash centre and if so, how much to order.

Special features of this problem are that lead times are generally stochastic and, particularly for outlying branches, these times can be longer than the review period. This means that a manager can be faced with the problem of placing an order for cash when the previous order is still outstanding. Another feature, peculiar to banking, is that the demand for cash is actually the net demand, being the difference between customer withdrawals and deposits. For banks which take in more deposits than withdrawals by customers, an order can actually be negative, which means that the delivery vehicle will actually pick up, rather than deliver, cash from the branch.

3.1.2 Cash replenishment at automatic teller machines (ATMs)

The typical situation here is that a cash vehicle visits each ATM in its area, usually on a daily basis, and often at night, when activity at ATMs is low. A periodic review model, with zero lead-time, is used to determine the replenishment level for an ATM at such visits. The model takes as input the cash balance at the time of the visit and the forecast cash demand distribution at the ATM over the next 24 hours, as well as the inventory holding and emergency replenishment costs.



In my experience, the Gamma and Lognormal distributions provide realistic and flexible models for the daily demand distribution. In an actual application using the Lognormal distribution, the mean was modelled within an analysis-of-variance framework, which took into account differences between ATMs, day-of-the-week and day-of-the-month effects, as well as monthly factors. Forecast demand distributions for each ATM for each day of the following month were provided by this model which also incorporated possible trends.

3.1.3 Scheduling and Routing cash vehicles

Given the schedule of cash deliveries and pick-ups from the branches of a bank, the cash centre needs to decide on the number of cash vehicles required and to provide a delivery schedule for each vehicle. This can be modelled as a Travelling Salesman Problem, with the additional feature that, for security reasons, a vehicle should not traverse exactly the same route every day.

3.2 Queueing and Simulation analysis

Classical queueing theory and simulation have obvious applications in the banking world:

3.2.1 Determining the number of tellers required at a branch

Most banks these days realise the advantage of having customers waiting in a single queue, with the person in the front going to the first available teller, rather than having a separate queue in front of every teller. This can be modelled as a queue with multiple servers and if we make the assumption that customers arrive randomly and that there are 'c' tellers whose service-times are all exponentially distributed, then the results from the classical M/M/c model can be used to determine the value of 'c' which balances customer waiting time against teller idle time. Rate-control models allow for variable arrival rates by increasing the number of tellers when the queue exceeds a specified length,

and reducing the number when the queue becomes too short.

Similar queueing models may be used to determine the minimum number of gateway ports into the bank's computerised information- and credit card authorisation services so as to ensure access within a maximum delay time (typically measured in seconds).

3.2.2 Automated valuation modelling (AVM) for home loans

One of the most time-consuming and costly activities in arranging financing on a new property is having it valued by a registered property valuator. This activity often constitutes a bottleneck in the process of granting home loans (mortgage bonds) by the bank. Nevertheless, this is an essential step in the process, as the bank uses this value as surety for the loan.

Automated valuation modelling (AVM) is used for desktop valuation of properties and does not require the use of valuers. AVMs use available data on a property, such as the date and price of the previous sale, current sale prices of properties in the neighbourhood and the size of the property, to estimate its current value. The repeat-sale model uses the prices of properties that have sold at least twice during the period of interest to estimate the property inflation rates over this period (via linear regression based on the log of the ratio of the two prices), either on a monthly or annual basis. Separate models are usually fitted to different regions or market segments, as well as to different property types, such as estates (apartments and housing clusters) or freestanding properties. These inflation rates are then used to estimate the current value of a property, based on its latest sale price. Recent sale prices in the neighbourhood can also be used to improve the estimate. Property valuations performed via AVM are much faster and cheaper than those performed by valuers and are increasingly being used by banks.

3.2.3 Analysing the processing of home loan applications

Home loans provide an important and generally highly profitable aspect of a bank's business. It is also very competitive, with banks and other loan granting institutions competing for customers' business. A critical factor in a customer's decision on whether to take a home loan from a particular bank is the speed with which it processes the loan application. A customer who has the choice between accepting the loan offer from one bank or of waiting for another offer from a second bank which is still processing his application, is likely to accept the bird in the hand.

The processing of home loan applications comprises a large number of interrelated steps, including the request for and perusal of the required supporting documentation, validating the customers' employment and income information, confirming the valuation of the house, usually through a visit by a valuator or via AVM, completion of the required legal documentation, and so on. I was involved in planning a simulation model for the bank's entire home loans processing system, which could be used to identify possible bottlenecks in the process, evaluate alternative procedures and practices and choose those which most effectively reduce the total processing time.

3.3 Fraud Detection

In order to combat the fraudulent use of a customer's credit card (either as a result of the card being stolen or its details having been fraudulently obtained) banks have been using both statistical discriminant analysis and neural networks to pick up changes in the card's usage pattern. Both the transaction frequency and value of transactions have been found to be useful discriminators between a customer's normal usage and fraudulent usage.

3.4 Cheque Processing

The processing of cheques is a labour-intensive activity and is typically carried out



a central location, with cheques deposited at ATMs subsequently being delivered to this location. There are many similarities between cheque processing and factory operations, and many OR techniques applicable to factories are also relevant here. Examples are job-flow optimisation and optimal scheduling of people to shifts.

4 Planning

I have been involved in a wide range of OR applications in banking falling under the general heading of planning. These include:

4.1 Capacity Planning

Banks are massive users of large computers which run all the financial transactions, head office operations, as well as those at branches and ATMs. These are typically housed in large, highly secure computer centres, and every year the bank spends large amounts on maintaining, updating and expanding its computing facility.

The OR group at the bank were involved in an exercise to forecast the growth of ATM transactions in order for the bank to be able to plan its computing requirements so as to cope with this growth.

4.2 Manpower planning

Banks are very large employers, and salaries constitute one of their major categories of expenditure. Because of the manpower intensive nature of many of the activities at branches, branch managers are continually requesting head office for extra staff to manage their growing workloads. In order to help assess these requests on a rational basis, the OR group used multiple regression modelling to establish the relationship between the manpower complement at a branch and its workload, as measured by several variables such as the number of customer accounts and the average numbers of different types of transactions processed in a day. Because of the recognition that many branches operated inefficiently, management wanted these branches to be excluded from the dataset used to estimate the model parameters. Data Envelopment

Analysis was therefore used to identify those branches that were “efficient” and only these branches were included in the modelling dataset.

4.3 Pricing of services

Because of the highly competitive nature of banking and the consequent high levels of customer “churn” (customers changing their bank), banks are continually reviewing their fee structures (fees for cheques, various ATM transactions, etc) in order to try and retain their current customers and attract new ones, but without losing the income generated from these fees.

In order to be able to assess the impact of any proposed fee changes, both on customer costs and on the bank’s income, a random sample of customer accounts was selected and every transaction conducted on these accounts over a period of a few months was stored in a database. This served as a simulation dataset on which the effects of any proposed fee changes could be evaluated before being implemented, thus considerably reducing management’s uncertainty when reviewing their fee structures.

4.4 Design and analysis of surveys

Banks are continually running surveys on their customer base in order to assess market-related aspects such as customer satisfaction, brand image and awareness. This is an area in which the OR team’s involvement, both in the design of the surveys and in the analysis of results, can considerably enhance the validity and value of the conclusions.

4.5 General decision making

4.5.1 The Analytic Hierarchy Process (AHP)

The AHP and other multiple criteria decision making tools have been used in a number of areas to assist in decision making:

- Deciding on software purchases
- Developing an audit risk model to

establish priorities for the auditing of the different departments in the bank by its internal auditors

- Performing scenario analyses in strategic planning
- Identifying inefficient branches which could be closed down.

4.5.2 Optimal location

A gravity model was developed to identify optimal locations for bureaux de change which are situated outside the bank’s branches.

5. Marketing and customer relationship management

Multivariate and other statistical techniques are used to analyse customer behaviour and identify those customers who, for example, are likely to respond positively to a marketing campaign, or whose accounts may be at risk. Banks invest enormous amounts of effort and money in maintaining data warehouses containing detailed data on customer characteristics and banking behaviour, which the statisticians and OR analysts “mine” and turn into useful information.

5.1 Market segmentation

Multivariate techniques such as logistic regression, discriminant analysis and CHAID (or Classification Trees) are used to identify particular segments of the customer base for promotions and marketing, referred to in the trade as “leads analysis”. This activity is based on the assumption that a model which discriminates between customers who do, and who do not have a credit card, can also be used to identify customers who are likely to respond positively to a credit card promotion.

5.2 Customer scoring

5.2.1 Application Scoring

Before a bank considers a loan application from a new customer, the application is



scored using information supplied on the application form, as well as any information on the applicant's credit record available from the credit bureau. If this score falls above an upper cut-off level, then the application is accepted, and if it falls below this level then it is rejected. Sometimes banks use a discretionary score band where the manager will decide, often on the basis of an interview, whether or not to grant the loan.

Scoring formulae (or "score cards") are developed from the records of random samples of "good" and "bad" customers with respect to a particular loan product, usually via statistical Discriminant analysis or Logistic Regression. A generic problem when developing application scoring formulae is that the data come from customers who were initially accepted by the bank and then they turned out to be either "good" or "bad" customers. No information is available on customers who were not accepted by the bank, although in practice the score card will also be used to assess the applications from such customers. This problem is referred to as "reject inference", and various proposals for it have been made in the literature.

5.2.2 Behaviour Scoring

This is the general term used to describe formulae developed to monitor the re-payment performance of customers with respect to particular loan products in order to detect early warning of possible defaulters. Typically, these formulae are based on re-payment frequencies, skipped payments, account balances, transaction frequencies and other behavioural variables during the previous, say, six months. As with application scoring, the formulae are developed using Discriminant analysis or Logistic Regression, using random samples of actual defaulters and non-defaulters to train the classifiers.

5.3 Customer retention

A key fact in banking is that it costs far more to attract and sign on a new customer than it does to retain an existing customer. Nowhere is this more evident than in the area

of home loans, since the cost of evaluating a customer and registering a bond on his or her property generally exceeds the interest which the bank earns from the loan, even up to the first 18 months. The longer the customer has the home loan, the more profitable it is for the bank.

It is therefore important for the bank to understand the lifetime distribution of home loans - the distribution of the length of time that customers hold their bonds with the bank - and how this distribution is influenced by customer characteristics (such as age, income, etc) as well as by characteristics of the property and of the loan (loan amount relative to the value of the property, interest rate, the market segment, etc).

Survival analysis, using the proportional hazards model, has been used to analyse the lifetime distribution of home loans and how it is influenced by customer, property and loan characteristics. This in turn allows for the identification of those customers who are most likely to close their accounts in the near future and for them to be targeted with incentive schemes aimed at encouraging them to retain their loans.

Another approach is to analyse changes in customers' account behaviour patterns (changes in repayment amounts and frequencies, skipping repayments, etc) in order to develop "triggers" for identifying customers who are in danger of defaulting or closing their account, so that remedial action can be taken to prevent this from occurring. Logistic regression, CHAID (classifications trees) and discriminant analysis are techniques frequently used for this purpose.

5.4 Customer profitability and lifetime value analysis

Multiple regression analysis has been used to identify how the profitability of a customer to the bank is influenced by his or her characteristics (including the bank products held) and account behaviour (transaction frequencies, account balances, etc). A better way of doing this is through Expected Lifetime value (ELTV) analysis, in

which the customer's lifetime distribution is estimated through a proportional hazards model, his profitability is estimated by regression, and these are brought together, including the discounting of future revenue streams, through the ELTV technology.

5.5 Multivariate statistical analyses

Multivariate techniques, such as correlation, Factor, Correspondence analysis and other statistical techniques are used for analysing marketing and advertising data and evaluating their effectiveness.

6. The financial area

While traditionally, the so-called "Quants" in the banking world have confined themselves to the financial area, focusing on areas such as derivatives trading and hedging strategies, the general OR analyst nevertheless has an important role to play here.

6.1. Financial modelling

6.1.1 Financial arithmetic

Perhaps surprisingly, the OR analyst is sometimes called upon to perform fairly simple (if you know how) financial calculations, such as:

- Interest rate calculations
- Discounted cash flow analyses
- Re-payment schedules
- Variance analysis, to compute the changes in overall profit resulting from changes in size, product mix and profitability in a firm's sales.

6.1.2 Risk analysis

With the adoption of the Basel II accord by financial institutions, banks are required to analyse the risks to which they are exposed under the three headings:

- » Credit Risk,
- » Operational Risk, and
- » Market Risk

The OR analyst is well placed to assist in this process, as the following projects attest:



- Variance/covariance analysis to assess the payment default risk on a portfolio
- Setting trading limits for financial traders
- Modelling for operational risk

6.1.3 Asset Liability modelling

This is a specific form of risk analysis which is aimed at understanding and minimising the risks due to mismatches in the maturity patterns of the assets and liabilities of a bank. Examples are:

- Duration analysis
- Gap analysis
- Liquidity management
- Analysing the bank's exposure to fluctuations in the yield curve
- Portfolio optimisation via linear programming or risk/return analysis

6.2 Forecasting

An important area for forecasting is in budgeting, where forecasts of the total balances in the different types of account operated by the bank are required for every month over the budget period. Box-Jenkins seasonal ARIMA models are typically used for this purpose.

More complex cointegration and vector autoregression has been used for the joint modelling of interest rates and exchange rates.

6.3 Derivatives markets

As mentioned earlier, financial institutions invest a lot of modelling effort in tackling problems this area, examples of which are:

- Pricing futures and options using Black-Scholes and related methodologies

- Hedging portfolios with derivative instruments
- Analysing interest- and exchange rate risk in foreign currency options.

7. Conclusion

As is evident from this article, the opportunity for applying OR in the banking world is vast, and banks are becoming increasingly aware of its value. It is certainly a burgeoning field for budding OR analysts. There is a growing literature on the subject, and those interested in learning more than is given in this overview are encouraged to consult it.

Prof L Paul Fatti, *Emeritus-Professor, University of Witwatersrand, South Africa*

1ST INTERNATIONAL CONFERENCE ON APPLIED OPERATIONAL RESEARCH (ICAOR'08)

15-17 September 2008

American University of Armenia
Yerevan, Armenia

ABSTRACT

The conference is a yearly forum which brings together academics and practitioners from around the world with an opportunity to discuss current issues in an informal setting. The ICAOR 2008 conference will take place at American University of Armenia (AUA) in the city of Yerevan. We invite you to join your colleagues for this international meeting.

Conference Theme

The conference will cover all aspects of operational research with particular emphasis being placed on applications, including, but not limited to:

- Accounting, Auditing & Tax
- Agriculture & Fisheries
- Artificial Intelligence
- Combinatorial Optimisation

- Data Mining
- Decision Analysis & Support
- Defence & Military
- Energy, Natural Resources & Environment
- Financial Services
- Forecasting
- Graphs & Networks
- Health & Social Services
- Heuristics
- Information Science
- Location Analysis
- Maintenance
- Manufacturing & Services
- Marketing
- Mathematical Programming
- Meta-Heuristics
- Optimisation
- Organisation
- Quality, Statistics & Reliability
- Queuing



- Revenue Management & Pricing
- Scheduling
- Simulation
- Telecommunications
- Timetabling
- Transportation, Traffic & Logistics

Paper Submission

Researchers wishing to contribute to the conference are invited to submit manuscripts of not more than 12 pages either as full papers or extended abstracts. The working language of the conference is English. Authors are encouraged to prepare their manuscripts in LNCS style using the MS Word template provided by Springer, please see Information for LNCS Authors.

Papers should be submitted in MS Word (.doc) via email to tadbir@tadbirstm.org.ir. Each submission will be assigned an identification number. Please quote this in all correspondence.

All submissions will be reviewed by at least two referees, and successful papers will be included in the Conference Proceedings.

Special Issue

The authors of accepted papers will have the opportunity to submit extended versions of their papers for consideration to a post-conference special issue of the Journal of Applied Operational Research (JAOR) ISSN 1735-8523. We celebrate JAOR's launch at this particular occasion.

Important Dates

- 15-Sep-07 - Submission opens
- 15-Apr-08 - Paper submission deadline
- 31-May-08 - Notification of decisions
- 10-Jun-08 - Registration deadline
- 30-Jun-08 - Camera-ready deadline
- 15-Sep-08 - Conference starts

Organising Committee

Kaveh Sheibani, Tadbir Institute for Operational Research, Systems Design and Financial Services, Iran
Ben Atkinson, London Metropolitan University, UK

International Programme Committee

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Kaveh Sheibani, Tadbir Institute, Iran

Registration

The registration fee is £250 (GBP) per delegate. This includes participation in all sessions, the proceedings, coffee breaks, refreshments, lunches and conference dinner on Monday 15th September.

Conference Venue

American University of Armenia
40 Bagramyan Ave
Yerevan 0019
Armenia

About Armenia

American University of Armenia (AUA) is located in Yerevan, the capital of Armenia, considered to be one of the oldest cities in the world, founded around 782 B.C. Today, Yerevan is an urban metropolitan centre with about one million residents. It covers about 300 square kilometres. Yerevan lies at an altitude of between 950 and 1200 meters above sea level and is surrounded by beautiful hills and mountains. Mount Ararat is visible from many parts of the city. The climate is generally moderate. Winter can be harsh, however, particularly in the mountainous regions. Spring is short lived. Summer lasts four months. Autumn is mild and sunny. The city, like many other cities, is built around a central downtown area. It has many squares and open spaces offering travellers a chance to explore it by walking along parks, fountains, and numerous monuments. Yerevan is also renowned for its active cultural and artistic life with annual opera, ballet, symphony and theatre seasons. It is home to several museums ranging from modern art to history and culture. The official language of Armenia is Armenian. Most people know Russian, and English is fast becoming a commonly used foreign language.

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VI ALIO/EURO WORKSHOP ON APPLIED COMBINATORIAL OPTIMIZATION

December 15 - 17, 2008, Buenos Aires, Argentina

<http://alioeuro2008.dc.uba.ar/>

FIRST ANNOUNCEMENT

The VI ALIO/EURO Workshop on Applied Combinatorial Optimization will be held from December 15th to the 17th of 2008 at the campus of the Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Buenos Aires, Argentina.

The Association of Latin-Iberoamerican Operational Research Societies (ALIO) and the Association of European Operational Research Societies (EURO), both within the International Federation of Operational Research Societies (IFORS), organize their joint sixth conference devoted to Combinatorial Optimization. The main purpose of the ALIO/EURO Workshops of Combinatorial Optimization is to bring together Latin American and European researchers and to stimulate activities and discussions about methods and applications in the field of combinatorial optimization. Researchers from other countries are obviously welcome to participate.

Previous locations of ALIO-EURO Workshop on Applied Combinatorial Optimization were:

Rio de Janeiro, Brasil, 1989.

Valparaiso, Chile, 1996.

Erice, Italy, 1999.

Pucon, Chile, 2002

(<http://www.inf.puc-rio.br/alioeuro2002>)

Paris, France, 2005

(<http://www.infres.enst.fr/~charon/alio>)

**** Main topics in this conference will be:

Approximation algorithms
Bio-informatics
Complexity
Graph Theory

Game Theory
Integer Programming
Logistics
Metaheuristics
Mathematical Programming
Networks

**** Abstract Submission

Authors are invited to submit an extended abstract no longer than 6 pages on letter-size paper using at least 11-point font. Instructions for electronic submissions will be posted at the conference web page <http://alioeuro2008.dc.uba.ar/>.

Extended abstract submission begins on June 1st and ends on July 31st. August 30th authors will be notified whether or not their paper has been accepted.

**** Publication

A selection of full papers will be published in a special issue of the Journal International Transactions in Operational Research (edited by Celso Ribeiro), published on behalf of IFORS (The International Federation of Operational Research Societies), Blackwell Publishing.

**** Confirmed plenary talks

The following invited speakers have been confirmed so far:

Martine Labbé (Université Libre de Bruxelles, Belgium)
Celso Ribeiro (Universidade Federal Fluminense, Brazil)
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**** Important Dates

June 1st, 2008: Opening of the Paper Submission
July 31st, 2008: Abstract Submission Deadline
August 30th, 2008: Notification of paper acceptance

December 15-17, 2008: The VI ALIO/EURO Conference on Applied Combinatorial Optimization

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