



OPERATIONS RESEARCH SOCIETY OF SOUTH AFRICA OPERASIONELE NAVORSINGSVERENIGING VAN SUID-AFRIKA

NEWSLETTER
NUUSBRIEF

JUN/JUL 1974

1. MEMBERSHIP/LIDMAATSKAP

We are pleased to announce the following new members:
Ons kondig met genoeë die volgende nuwe lede aan:

Full members / Volle lede

R.R. Lewis	Johannesburg
K.G. van der Poel	W Cape/Kaap
D.S. Wright	W Cape/Kaap

Associate members / Mede lede

Miss B. Mortimer	Johannesburg
J.F. Botha	W Cape/Kaap

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Anyone who is aware of the current addresses of the following members is asked to communicate such to the secretary:

D.F.R. Geden
N. Harding

2. TOM ROZWADOWSKI AWARD / TOEKENNING

Nominations are now called for the above-mentioned award. This award, in the form of a silver medal, is made annually in memory of the late Tom Rozwadowski for papers of outstanding merit delivered by members of the Society. Lectures which have been presented during the previous year at either ORSSA Chapter meetings or at the Annual Conference and which are available in written form, may be considered for the award. The medal shall be awarded at the Conference. Nominations may be submitted to the Secretary, P.O. Box 462, Stellenbosch, 7600.

Nominasies vir bogenoemde toekenning word nou ingewag. Die toekenning is in die vorm van 'n silwermedalje en dit word jaarliks ter nagedagtenis aan wyle Tom Rozwadowski toegeken vir lesings van hoogstaande gehalte deur lede van die Vereniging. Lesings wat in die vorige jaar by 'n byeenkoms van 'n tak van die Vereniging of by die Jaarlikse Kongres gelewer is, en wat in geskrewe vorm beskikbaar is, kan in aanmerking kom vir die toekenning. Die medalje sal tydens die Kongres toegeken word. Nominasies kan gestuur word aan die Sekretaris, Posbus 462, Stellenbosch, 7600.

3. ANNUAL CONFERENCE / JAARKONGRES 1974

Those intending to submit papers for the annual conference in November are reminded to notify the convener of their intention and topic as soon as possible.

Die wat van plan is om 'n referaat vir die jaarkongres in te dien, word herinner om die sameroeper so gou doenlik in kennis te stel van hulle plan en titel.

Dr A.H. Money,
Department of Mathematical Statistics,
University of Cape Town,
RONDEBOSCH.
7700

4. IFORS

The 7th Triennial Conference of IFORS takes place in Japan from July 17-23, 1975. The Institute of Management Sciences (TIMS) will probably be holding a 2-3 day International Conference in Japan directly after the IFORS Conference.

As a member society ORSSA will be entitled to send 5 delegates to the IFORS Conference and members interested in attending are asked to contact the Secretary.

The Conference will have three main aspects:-

1. Theme Papers
2. National Contributions
3. Forum Papers.

Theme papers should relate to "Operations Research in the Aid of Developing Countries". Persons wishing to submit papers on this theme are at liberty to do so. Four copies plus an abstract of 150 words should be sent by August 31 to the ORSSA Secretary who will relay the documents to the IFORS referees.

National Contributions may relate to any OR topic. Each member society is entitled to present at least one "Official" contribution and the National Committee of ORSSA would be very pleased to receive papers from members for consideration as our National Contribution. In particular those who have previously presented papers at ORSSA conferences may wish to submit these papers to the National Committee for review. The deadline for submission of papers to the ORSSA Secretary is September 1.

Any delegate may present a Forum Paper. The papers will not be selected or refereed and will provide delegates with the opportunity to discuss any issues with other interested persons at the conference. Further information on Forum Papers may be obtained from the ORSSA Secretary.

5. CASE STUDY FROM "A NOVENNA TO ST. JUDE"

We continue with the second case study from the article of the above name by R.E.D. Woolsey, reproduced by courtesy of the Editors of the TMS journal INTERFACES

The Celebrated Brand X Washing Machine Shipping Catastrophe

In the early days of integer programming, people noticed that integer programs looked just like linear programs, with integer requirements on the variables. Demigods of the profession showed that you could solve various algorithms in a finite number of steps. Of course, the fact that a company that tried to solve one might be bankrupt before the finite number of steps was reached was totally immaterial to most of the people at the ORSA conferences.

There was once a manufacturer of washers and dryers that had just bought a shiny new O.R. group. The O.R. group was, in fact, purchased en bloc from another company. In the early days O.R. groups were always bought en bloc, because the guy they left behind might be the one who knew what he was doing. The O.R. group was brought in and told: "Do some of that good stuff." The O.R. group decided to do a study on shipping the washers and dryers. The first thing the study discovered was that if you buy a boxcar to go from point A to point B, you buy it empty or full. The railroad is monstrously indifferent as to whether it has anything in it. They will, on or about the date it is supposed to move, come and get it. And, on or about the date it's supposed to arrive, it will, in theory, arrive there.

The first conclusion was that, clearly, shipping partial boxcar load lots was inefficient as well as costly. The fact that "inefficient and costly" is a general description of railroads somehow escaped notice. Therefore, it was clear that the only way you should ship washers and dryers was in boxcar load lots. Now, one result of this policy is that if some wholesaler out in West Broken Toe, Wyoming, says he needs six dryers, he's got to wait until he needs a boxcar full. Well, they recommended this and somebody pointed out that the wholesalers wouldn't like that. The O.R. group's reply was essentially: "The wholesalers can eat it, this is the optimum plan."

So they implemented the optimum plan, formulated as a large linear program, which would tell you where and where and when the boxcar loads ought to be shipped. That meant, if you ordered a few washers, they put them on some palettes. Those palettes that were going in the same general direction were then kept together, and then the palettes finally got to be a boxcarload, they would fill a boxcar, put it on a train, and get it to you. Well, very rapidly, as you can imagine, they started running out of warehouse space. They had all these partial palettes sitting around, waiting until the guy could finally order some more washers and dryers. They finally were renting warehouse space across town.

They then had to hire a trucking firm to take the partial palettes to other warehouses and bring them back when they were full to be put on boxcars.

After this situation had gone on for about three months, the bean counter section finally began to get interested in rising costs in warehousing. And a bean counter came in with his green eyeshade, and his sleeve garters, and pointed out that a plot of the rising warehouse costs seemed to be best approximated by $\exp(x^2)$. The head of the O.R. group was not at all disturbed and pointed out that such advanced models usually take a while to get settled in. There was no question that costs would go back down; he told the bean counter to have faith. And the bean counter went away and pondered these thing in his heart.

Pretty soon, the O.R. analyst who was running this LP realized that what they were really doing was solving the problem as an LP and rounding the solution down to the integer boxcar load lots they wanted. He wondered to himself, just how different the integer programming solution to this problem might be. So he called a nearby data center and asked if they could run his problem on an integer programming code. Naturally, the man at the data center asked him how badly he wanted to solve it. He further explained that as the code was a dual code, until they got the optimal solution, they didn't even have a feasible solution. It was explained that you just paid your money and they would run until either you got the optimum solution or your money ran out. The money was put down and they ran the code for two or three hours and it hadn't converged. Various tricks were tried by the data center analysts and finally the last idea they tried worked, and the code converged in about fifteen minutes. It converged to the fact that there was no lattice point in the feasible region.

Now, let me draw a picture of that. That says the feasible region was so constrained that once they had built in all the cost constraints and everything, there was no way to ship integral boxcarload lots within their cost constraints. But you see, they were solving the linear program and then rounding down to the nearest integer answer, not thinking that that answer might not be feasible. So the people at the data center drew short straws to see who was going to go tell Brand X. The man who drew the short straw went over to Brand X, and he had never been there before. As a result, he just gave his answer to the first executive he found. That man happened to be the company comptroller. Now as arrogant O.R. groups tend to make mortal enemies of the bean counters, the head bean counter at Brand X was no exception. The company controller took that answer, along with the latest cost figures and went in and presented them to the president. In a four month period, that model had cost the company a little better than ~~3~~ 367,000 in excess shipping costs. So when the head O.R. man came back from his vacation he had no desk. There was no O.R. group there at all. And there hasn't been ever since.

6. CONGRATULATIONS

Our congratulations go to one of our members, Prof. D.H. Jacobson, on his appointment as director of the National Research Institute for Mathematical Sciences of the CSIR with effect from 1 January '75.

7. CHAPTER NEWS

7.1 Western Cape

The last meeting of the chapter was addressed by Mr. G. Knudsen, Managing Director of the local Branch of the Murray and Stewart organisation. He gave a most interesting talk, illustrated with slides and a film, on his Company's use of critical path scheduling in the construction of the Nico Malan Theatre complex. The theatre was required for the use at the tenth anniversary celebration of the Republic, and at the time of going to tender there were just 26 months available to construct and fully equip the complex. Tenderers were given just three weeks to do a feasibility study. In these three weeks, Murray and Stewart drew up a network for critical path analysis, and ran it through a computer. Based on the results, they concluded that it would just be possible to meet the deadline.

Every detail of the task was planned: from exactly how many and where all the cranes should operate, to exactly which entrances to the site each truck bringing materials should use. Probably one of the most formidable of their tasks was slotting in and controlling the more than sixty subcontractors required for installing all the specialised equipment needed in a theatre complex. Another problem was that various items could only be obtained overseas. Amongst these was marble from Italy for the foyers and electrical equipment from Germany. The whole complex operation was kept on schedule by a policy of continual checking and chasing. This even involved a trip to Italy to see that the marble was loaded on time. A further major problem was that in order to complete the roofing structure in time to instal the highly complex mass of electrical wiring, lighting fittings and airconditioning ducts required in the auditoria, the roof had to be constructed on temporary pillars so that work could proceed simultaneously with the erection of the walls.

In all this vast agglomeration of detail, critical path scheduling played a vital part, enabling management to constantly monitor and control progress, and the project was completed on schedule.

Following the talk, the theatre management conducted us on a tour of the building, showing us much of the highly complex stage machinery which enables one man to completely

change the set in a matter of minutes by operating a few buttons. Other sophistications include computerised lighting sequences and a complex of dressing and rehearsal rooms with a complete internal communication system.

After the tour, we were treated to coffee, drinks and snacks, and this completed the evening. Our thanks go to Mr. Knudsen for sparing the time to address us and to the management of the Nico Malan for laying on this highly successful and interesting evening.

Next meeting:

On the 5 August there will be a joint meeting with the Statistical Association, to be addressed by Mr S. Piper of the department of Applied Mathematics and Environmental Studies of the University of Cape Town.

7.2 Joint Meeting : Johannesburg and Pretoria

On wednesday 24 June, a cold and freezing evening in Johannesburg, a small but enthusiastic audience turned out to hear Dr J. Kowalik of the Sir George Williams University, Montreal, Canada, address a meeting on the optimization of large-scale systems. Two points were demonstrated.

- 1) Even non-linear programs of variables can be handled by taking note of special forms
- 2) Care has to be taken in such problems that constraints as given allow any feasible solution.

Ref: Cagnon, Hicks, Jacoby and Kowalik: " A non-linear programming approach to very large hydroelectric system optimization" Mathematical Programming Vol 6 No 1 Feb 1974.

7.3 Johannesburg Chapter

A joint meeting with the computer society is planned for 17 July at which the speakers will be Mr. Hendrik du Plessis of SANLAM and Mr Mike King. The topic of the evening will be the use of Operations Research in developing Management Information Systems. More details are being circulated to local members.