

OPERATIONS RESEARCH SOCIETY OF SOUTH AFRICA

OPERASIONELE NAVORSINGSVERENIGING VAN SUID-AFRIKA

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P. O. Box: 3982  
Posbus:

BULLETIN

Junie 1970

INTERNATIONAL NEWS.

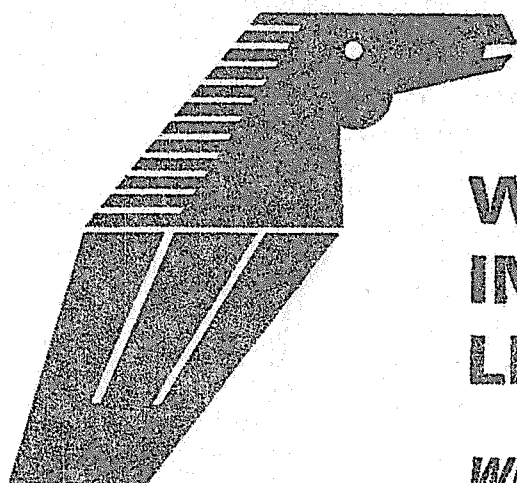
The 38th National Meeting of ORSA will be held from October 28th to 30th, 1970, at the Statler-Hilton Hotel, Detroit, Michigan. Some of the areas to be discussed are:

- The use of planning models in health systems,
- Urban transportation,
- Community planning,
- Application to library and information systems,
- OR techniques in water resources development,
- Analytical models of time-shared computing systems,
- Management information systems,
- Simulation.

THE BULLETIN.

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# WESCO INVESTMENTS LIMITED

***WE ARE CREATING A NEW  
POSITION IN THE WESCO GROUP OF COMPANIES***

## **INVENTORY MANAGEMENT.**

### **FUNCTIONS:-**

- (a) To analyse and appraise methods of inventory management and control of subsidiary and associated companies.
- (b) To assist and supervise the implementation of improved up-to-date systems.
- (c) To devise and implement effective methods of reporting on inventory levels.
- (d) To take the required managerial action to maintain proper inventory levels.

### **QUALIFICATIONS REQUIRED:**

- (a) University degree, preferably with advanced studies in mathematics and mathematical statistics.
- (b) Knowledge of the science of computers, more particularly as applied to inventory control.

### **PERSONALITY REQUIREMENTS:**

Applicant must be able to:

- (a) Obtain the co-operation of senior and junior accountants and inventory personnel.
- (b) lead, motivate and discipline staff and
- (c) must have a desire to be a leader and manager

**EXPERIENCE** in inventory control and management will be a recommendation.

### **IDEAL AGE:**

Between 30 and 35 years.

### **SALARY:**

To be negotiated depending on qualifications and experience.

As we are looking for a senior man with leadership potential, we do not think that an applicant presently earning much less than R6,000 per year will be suitable.

**SUCCESSFUL APPLICANT** will be given adequate opportunity to acquaint himself with the Group policy and practice.

**APPLY TO:** The Managing Director,  
Wesco Investments Limited,

P.O. Box 9772,

Johannesburg.

Telephone: 838-1041/2.

**PLEASE NOTE:** If you are not personally interested in this position but have a student or acquaintance who might qualify and be interested, please show him this advertisement.

## VOORLOPIGE KENNISGEWING VAN NASIONALE KONGRES

### DATUM EN PLEK

Die 1970 Kongres vir Operasionele Navorsing sal in Pretoria gehou word op 20 en 21 November. Verdere inligting oor die lokaal, program, fooie en besonderhede oor verblyf- en ander reëlings sal later bekend gemaak word. Die plek en datum is egter finaal en diegene wat graag die kongres wil bywoon kan begin om dienooreenkomstig reëlings te tref.

### OPROEP VIR LESINGS

Soos almal weet, hang die sukses van so 'n kongres tot 'n groot mate af van die lesings wat aangebied word. Die Kongres Reëlingskomitee doen dus 'n beroep op almal met interessante O.N.-probleme om 'n lesing voor te lê vir aanbieding. Daar sal geleentheid wees vir 'n redelike aantal lesings aangesien voorsiening gemaak word vir parallelle sessies indien nodig.

### PROSEDURE

'n Opsomming wat nie 200 woorde oorskry nie van die voorgenome lesing moet aan die Kongressameroeper gestuur word voor of op 15 Augustus 1970. Die opsomming moet insluit die titel van die lesing, die outeur se naam en titels, werksverband en volledige adres.

'n Konsep van die lesing moet die Kongressameroeper nie later nie as 30 September 1970 bereik. Dit is vir beoordeling deur beoordelaars wat deur die Reëlingskomitee benoem sal word.

Na aanvaarding sal die outeur versoek word om 'n aantal kopieë van sy lesing op eie koste voor te berei vir vooraf sirkulasie deur die Reëlingskomitee. U sal betyds van die presiese aantal in kennis gestel word wat van die orde 100-150 sal wees.

### LENGTE

Daar is geen beperking op die lengte van die geskrewe lesing, wat in Afrikaans of Engels kan wees, nie. Die aanbieding word egter beperk tot 20 minute om die belangrikste aspekte toe te lig.

KONGRESSAMEROEPER

Rig asseblief alle korrespondensie aan:

J.W. Grobbelaar,  
O.N.S.A. Kongressameroeper,  
Posbus 392,  
PRETORIA.

## ADVANCE NOTICE OF NATIONAL CONFERENCE

### DATE AND PLACE

The 1970 Conference on Operations Research will be held in Pretoria on the 20th and 21st November 1970. Further information on the exact venue, programme, fees and details of accommodation and other arrangements will be sent out in due course. The date and place can be accepted as final and persons wishing to attend can make arrangements accordingly.

### CALL FOR PAPERS

As we all know, the success of such a conference depends largely on the papers contributed. The Conference Committee therefore appeals to all with interesting O.R. problems to submit a paper. There will be opportunity for a fair number of papers to be read as provision will be made for split sessions if necessary.

### PROCEDURE

A summary, not exceeding 200 words, of the intended paper is to be submitted to the Conference Convenor not later than the 15th August 1970. The summary should contain a heading including Title of paper, Author's name and title, business affiliation and complete mailing address.

A draft paper for refereeing purposes must be in the hands of the Conference Convenor not later than the 30th September 1970. Referees will be appointed by the Conference Committee.

After acceptance the author will be requested to have copies prepared at own expense which will be circulated in advance by the Conference Committee. He/she will be notified of the exact number which should be of the order of 100 - 150.

### LENGTH OF PAPER

There is no restriction on the length of the paper which can be in either Afrikaans or English. However, the presentation will be limited to 20 minutes for highlighting the paper.

CONFERENCE CONVENOR

Please address all correspondence to:

J.W. Grobbelaar  
O.R.S.S.A. Conference Convenor,  
P.O. Box 392,  
PRETORIA.

PRETORIA CHAPTER

of

THE OPERATIONS RESEARCH SOCIETY OF SOUTH AFRICA

Last Meeting

At our previous meeting Dr. P.W. de Lange of I.C.L. gave a very interesting and stimulating lecture on his recent discussions with O.R.-experts in Italy and France. The contents of this lecture was considered by the audience to be of too great importance to be limited to those present and therefore he will on request submit it to the Bulletin for publication at a later stage.

Next Meeting

Date: 10th June, 1970  
Venue: Room 306, Mathematics Building, Pretoria University (opposite the Aula)  
Time: 8.00 p.m.  
Speaker: Mr. M.H. Moys  
Topic: "A replacement model for a fleet of vehicles"

Mr. Michael Moys obtained his B.Sc. (Eng.) at the University of Witwatersrand. He became interested in Operations Research and did some useful O.R. work whilst doing his military training in Pretoria. He is at present in the employment of Anglo American Corporation.

## NEWS FROM THE JOHANNESBURG CHAPTER

### LAST MEETING

A standing-room-only audience heard Mr. Frank Fiore of Anglo-Alpha Cement deliver an address on "Transportation Models." The theme of Frank's talk was set by his remark that "A transportation model is a tool for idiot children, but its worth a lot of money." He then went on to describe two uses to which the models had been put in his own firm. The first was as a tool for planning expansion of production capacity to meet forecasted growth in the country's demand for cement. The second was for planning the distribution of cement, which involved solving the model every couple of months. The latest model contained 5 sources (factories) and some 750 destinations (stations) - quite a respectable size, even when using a computer to solve it.

While the formal part of Frank's address lasted only about 20 minutes the interest in this subject was such that he was kept busy with questions for a further half hour - and was again cornered by interested members when he joined us for tea following the meeting.

One aspect which generated a lot of questions was the forecasts used to supply data to the model for expansion planning. There seems to be quite a lot of interest among our members in the economic side of O.R. Taking this into account, your Committee will attempt to arrange for speakers at some future meetings on subjects like forecasting, econometrics, finance, or management accounting as related to O.R. (Have you ever tried to get good cost data for your model from your Accounting Department?)

### NEXT MEETING

Date : Wednesday, 17th June, 1970

Venue : University of the Witwatersrand, Geology Building, Room G201

Time : 8:00 p.m.

Topic : "Is simulation the last resort?"

Our first inter-active meeting of 1970 will take the form of a panel discussion on simulation. The exchange of views should be of wide interest and a limited number of questions from the floor will be welcomed. Panel members will be asked for their ideas on what simulation really is, when it can (and cannot) be used, their



experience with it, and what its strengths and weaknesses are.

The discussion will be chaired by Prof. Kerrich and members of the panel will be Dr. Brown, Mr. Cohen, Mr. Sankey, and Dr. Sichel.

Members are reminded that anyone is welcome to attend our meetings. If you know of people who might be interested in a particular meeting, bring them along. One of the prime objectives of our Chapter is to promote a wider interest in, and awareness of, Operations Research in the Johannesburg region.

#### FUTURE MEETINGS

The dates for future meetings are given here so you can write them into your diaries right now. Any changes will be notified in the Bulletin.

17th June

22nd July

19th August

16th September

21st October

Meetings are almost always held at 8 p.m. on a Wednesday evening, usually the third Wednesday in the month and usually at Wits. Any suggestions for improvements on this arrangement would be welcomed by your Committee, as would suggestions for future speakers and/or topics.

TOPIC: An Incentive Model in the Retail Industry.  
PRESENTED TO: Operations Research Society of South Africa  
(Johannesburg Chapter)  
DATE: 15th April, 1970.  
SPEAKER: T. Winer of Systems Programming (Pty) Ltd.

#### SUMMARY.

The talk described a salesman commission scheme that had as its basic aim the creation of a strong incentive for salesmen to conduct sales according to company policy; or according to some short term over-riding tactic.

A computerised "model" is used which is very simple and non-mathematical. The significant characteristic of the model is that it is not a model of a process but of policy.

Basically, policy is translated into parameters which control the computer procedures, which exert psychological and financial pressure on salesmen to adhere to the policy.

Advantages of the system are that it shortens the time that elapses between management decisions being made and their implementation. It creates up to the minute standards against which staff and sales performance is measured.

The model has many variables which make it receptive to changes of policy.

#### BACKGROUND.

This system was developed at Rave Stores Limited by Mr. Dion Friedland. Rave was, at the stage that this system was first conceived and implemented, a small, rapidly growing, one-man hard goods discount store specialising in appliances, photo and sounds merchandise. It was not bound to set procedures which had been developed over the years. It was thus very easy to

establish new policy and procedures. In addition, the Managing Director was directly involved with all aspects of the company's business and knew, from direct personal experience, how the various factors influencing the business interacted.

#### NEED FOR AN INCENTIVE SCHEME.

The company's success was due to many factors - clear-cut image, comprehensive product line, low prices, excellent advertising and promotion - but an overriding condition for continued success was the quality of the salesmen; since the number of salesmen employed was directly proportional to the growth of the company, while the other factors remained easily controllable as the organisation grew.

The Managing Director was thus perturbed to find that he could sell better than his salesmen - not necessarily more, but certainly better. That is, he could conduct a sale in such a way that it was most beneficial to the company. In the main this consisted of selling high profit items whenever possible; and selling so as to minimize customer-returns of merchandise; and ensuring that the customer would come back to the store again.

As the company grew, more and more salesmen were employed, none selling as well as the Managing Director. The salesmen's morale was high and their product knowledge good. Rather than assuming that the salesmen were mediocre, or that he was a "natural" salesman, the Managing Director tried to analyse his success and their relative failure. It was found that the main difference was that he knew how and what he wanted to sell, because he knew WHY a particular conduct of a sale was in the best interests of the company.

It was decided that the ideal way to get the salesmen to perform better was to ensure that they knew the WHY, everytime they were conducting a sale. This is clearly not possible because the WHY encompasses company policy, stockholding, profitability of an item, competition's posture, cash-flow position and many other factors which it is neither desirable, nor possible, to divulge to salesmen. The solution was therefore to motivate them to sell the way they would sell if they knew and understood all implications of the WHY factors.

Instead of attempting to create a model of all factors contributing to a "good" sale, it was decided to consider only the factor at the top of the list - Net Profit. Net Profit is very difficult to measure, so Gross Profit was used. Gross Profit is a vital measurement in discounting and is constantly changing as a result of competition, promotion and buying opportunities.

So a salesman's commission scheme was set up based on PROFITABILITY, NOT VOLUME. This was a very simple system, but was possible because all sales were processed on a computer at unit-control level.

This long background has been given to illustrate that this commission scheme was not introduced simply because this is normal in retailing, or because it was considered to be a "good thing", but rather to satisfy specific objectives.

#### INITIAL SYSTEM.

The initial system formed part of a unit-control in which the following data were captured for each sale:-

- Document Type (Cash Sale, Staff Invoice, H. P. Sale etc.)
- Document Date
- Document Number
- Salesman Number
- Item Code (Check Digit Protected)
- Quantity
- Unit Selling Price
- Discount
- Net Sales Value

The Item Code was validated, the Unit Selling Price checked to the Unit Selling Price held on the Unit Master File and extension checked. Transactions were either rejected or accepted, accepted ones being reported on an exception listing if Selling Price or Extension was incorrect, or if a discount was given. Sales and Stock Analysis were produced. Since the handwritten dockets employed had the description of the item entered, the error rate, after validation and correction (including reference to the exception listing and original docket) was exceedingly low - approximately 0.5%.

The Unit Master carried, among other things, the following information per item per branch:-

Branch Code  
Item Code  
Classification Code  
Unit Cost Price  
Unit Selling Price  
H. W. T. Factor (described later)  
Points  
etc.

For all new master records, and all alterations to existing master records which affected the Unit Cost Price, Unit Selling Price or H. W. T. Factor, the Points associated for that item/branch were calculated (and stored on the master file) as follows:

$$\text{Points} = \frac{\text{Unit S. P.} - \text{Unit C. P.}}{x} \quad \text{in cents, dropping decimals}$$

Example: Unit S. P. = R12.50, Unit C. P. = R10.00  
x = 22.5

$$\frac{1250 - 1000}{22.5} = 11 \text{ points}$$

These Points were the points earned by the salesman in a "normal" sale, his commission being based on the points he earned. The Points were ~~separated~~<sup>reported</sup> on the branches' Code Lists, and on the price ticket on the merchandise, so that the salesman were always aware of the points carried by any article. Each Salesman was given a target of points based on his salary and was paid 3c per point earned over target each month.

This basic system included the following embellishments:-

- (a) Items carrying equal profit are not equally good to sell since it is desirable to sell-out slow movers. The H. W. T. Factor was used to crudely control this. It could be set to 1 (Hot Items), 2 (Warm Items) or 3 (Tepid Items) in which cases the divisor x in the points calculation assumed values of 23.5, 23.0 or 22.5 respectively. Hot Items thus carried relatively fewer points than Tepid Items.

- (b) Salesmen lost all points for a sale (i. e. earned negative points) for a customer return.
- (c) Salesmen were penalised for giving discounts. The points earned by the salesmen were thus calculated as follows:-

$$\text{Points Earned} = \frac{\text{Net Sales Value} - \text{Master Cost Value}}{\text{Master Sales Value} - \text{Master Cost Value}} \times \text{Points on Master}$$

i. e. Earned zero points if sold at cost, full points if sold at "list price", pro-rata points in between and loses points if selling below cost.

- (d) Salesmen could not earn more points than appeared on Master, and could thus not earn a bonus by overcharging.
- (e) Salesmen were not penalised if Master Sales Value <sup>was</sup> ~~was~~ smaller than Master Cost Value, i. e. he earned zero points if company chose to sell below cost.
- (f) To permit short term tactical decisions to override the system, the Points could be updated directly on the Master during insertion or alterations of a master, bypassing the normal points calculation. If a particular item required to be heavily sold, its points could thus be made disproportionately high.
- (g) Salesment lost their points if the sales docket was in error.

#### RESULTS OF INITIAL SYSTEM.

Controlled, quantitative measuring of the systems performance was not attempted. The following effects were clearly apparent:-

- (a) Salesmen always consulted the Code List. This impresses the customer and ensures that the latest price is applied since price-tickets may be out of date. The salesman, of course, was looking for points.

- (b) Effect on sales of high profit items was startling. The Managing Director has estimated that the system resulted in gross profit increase by up to 4% of turnover. This is an improvement of about 15%.
- (c) Almost any stock could be moved at will by using override facility.
- (d) Documentation standard was very high because salesmen lost points for poor documentation.
- (e) Discounts were rare.
- (f) No policy, procedure etc. manual needed updating; and no salesmen training was necessary to effect a change in merchandising policy. When the points changed to reflect the new policy, the effect on salesmen was immediate.
- (g) Because points system represented the selling standard it was ideal for measuring salesman performance and was extensively used for this purpose.
- (h) This performance measurement standard was also used to measure the relative performance of branches, departments and merchandise classifications.
- (i) "Loss leaders" could be advertised to attract customers and be sold relatively infrequently as salesmen preferred to sell high-points items.

Points became a way of thinking throughout the organisation and gained complete salesmen acceptance. Further, it was found that the system worked best for best salesmen, and vice versa, thus magnifying the difference in relative salesmen performance. This aided salesmen assessment and selection.

ENHANCED SYSTEM.

The initial system was used for about 18 months. The experience gained during this period was used to design a greatly enhanced system. This enhanced system was implemented simultaneously with other significant enhancements to the Sales and Stock Systems. However, it was not used operationally so the effect of it could not be estimated.

The additional facilities included in the enhanced system were:-

- (a) Net profit, not gross profit, is the real criteria, but is very difficult to measure. To introduce some measure of the factors influencing net profit, the various selling cost overheads (delivery costs, warehousing costs, breakage rates, floor space requirements) were examined and crudely simulated by classification of merchandise. This was done by introducing a "loading factor by department and classification" which controlled the gross profit to points transformation so that high overhead classifications earned relative less points than low-overhead classifications. This "loading factor" was manually controlled by means of a parameter card.
- (b) Earnings attitudes differ throughout the country. To permit the ratio of salary to commission to be altered, a "loading factor by branch" was introduced which modified the formula for calculating the Target Points from salary.
- (c) In discounting, cash sales are very desirable. Bonus points were thus earned on cash sales or on H. P. deposits which exceeded the minimum deposit required.
- (d) It was found that salesmen who did not expect to exceed their target in any month were de-motivated. Also, the benefit to a company is not directly proportional to points-over-target. So the rate-per-point was made variable. A continuous function would be desirable but is impractical as salesmen could not keep a running total of commission due to them. The rate per point was calculated as follows:-

Under 50% of target	½c per point
50% to 100% of target	1c per point
100% to 150% of target	2c per point
Over 150% of target	3c per point



- (e) The opportunity for earning commission was not the same in all departments. This was particularly noticeable in new departments which were not yet part of the store's image; or departments affected by <sup>completing</sup> ~~completion~~. This resulted in salesmen "poaching" in other departments to the detriment of the departments which particularly needed competent, aggressive selling.

A "loading factor by department" was introduced to even <sup>out</sup> ~~and~~ the commission opportunity. Any department that consistently required bolstering by this "loading factor" obviously merited close investigation as a profit earning entity.

- (f) Because the points appeared on the price tickets, there existed the very real danger that competition could calculate the cost price of the item. It was intended to "scramble" the points, by department, to forestall this.

The enhanced system operated on both unit-, or class-coded items, the unit cost price of class-coded items being calculated from a dynamically updated "average" gross profit percentage maintained for each price group within a classification of merchandise.

#### REPORTS.

Reports produced by, or planned for, the system described were:-

- (a) Sales Staff Performance Analysis, containing, in addition to Salesmen identification, Value Sold; Value of Discounts; Value of Returns; Number of Customers; Average Value of Sales; Points; Sales Value Ratio; Percentage Cash Sales; Points Lost; Cash Bonus Points; Net Points Earned; Target Points.
- (b) Sales Staff Commission Statements, for each salesman: Number of Days not Worked; Net Value Sold; Gross Points Earned; Points Lost Due to Discounts; Points Lost due to Returns; Points Lost Due to Poor Documentation; Cash Bonus Points; Net Points; Target Points; Commission.

- (c) Sales Staff Management Report, for each salesman and by Department and Branch:  
Value of Sales; Gross Profit Percentage Earned; Net Points Earned; Salary; Commission; Commission as Percentage of Salary; Total Earnings; Earnings as Percentage of Sales; Earnings as Percentage of Gross Profit.
- (d) Prize winners reports reporting best or most improved performance in various areas.
- (e) Request report giving details of how commission was arrived at in order to satisfy any salesman that his commission statement is correct.

#### CONCLUSIONS.

It is felt that a commission - incentive scheme which is geared directly to the companies goals can be used to motivate people in almost any industry or occupation. A "model" of the company's goals is required, and may be very difficult to establish. In the incentive - scheme described, the system should be based on a mathematical model of Net Profit.

A number of general principles should be borne in mind:-

- (a) Incentives only motivate people if they are related directly to an activity that the subject can influence.
- (b) The incentive must be attuned to reflect the company's objectives and policy - else objectives and policy will be ignored by line staff.
- (c) The subject must know how and why he made money - and lost money.
- (d) The "system controls" must be able to be adjusted without the subject being aware of it. No explanation must be necessary.

POSTSCRIPT.

In the system described, the obvious logical extension, ~~is~~<sup>is</sup> to by-pass the salesman entirely and manipulate the behaviour of the customer directly by operating on a self-service basis and offering trading stamps on the basis of a Net Profit model.