# ORSSA Presidential Address

Kobus Wolvaardt, 1979

## Operasionele navorsing in die tagtigs

By die lewering van hierdie rede is daar nouliks twee maande oor voordat die jare tagtig 'n aanvang neem en die keuse van my onderwerp is in 'n sekere sin vanselfsprekend. Alhoewel vooruitskouings altyd gevaarlik is, is dit in ON se aard om die risiko van verkeerd te wees, te aanvaar as die prys van die insigte wat gewen kan word. Al is hierdie insigte nie honderd persent korrek nie, bly 'n goeie antwoord beter as geen antwoord.

Dit is nodig om die faktore wat 'n invloed op die bedryf van ON gaan hê, uit te ken en te ekstrapoleer. Hiervoor word hulle breedweg in die volgende groepe ingedeel:

EERSTENS is daar ekonomiese faktore. Die ekonomiese, politieke en militêre klimaat definieer die wyer omgewing waarin die operasionele navorser moet lewe en werk, maar kan ook 'n direkte uitwerking hê op die hoeveelheid en soort ON benodig. Die een sekerheid wat ons kan koester is dat Suid-Afrika nog inflasie gaan ondervind en dat energie nie goedkoper sal word nie. Werkloosheid onder ongeskooldes en 'n groter druk op geskoolde en veral hoogsgeskoolde arbeid kan ook verwag word. As die politieke klimaat reg is, kan die hele suider Afrikaanse ekonomie groot groei toon, maar wat groei ookal doen, ondernemings gaan toeneem in grootte en kompleksiteit. Dis onwaarskynlik dat die aktiwiteite verbonde aan verdediging en strategiese vervaardiging sal afneem en ON sal waarskynlik hier nog meer ingespan word mits die nodige mense gevind kan word.

Die TWEEDE groep faktore het te make met die berekeningssituasie soos wat ons dit in die tagtigs waarskynlik gaan ondervind. Die belangrikste aspek hier is die elektroniese ontploffing wat nog lank nie uitgewoed is nie. Die opwindendste wetenskaplike en tegnologiese ontwikkelings kom vandag op hierdie gebied voor en ontwikkeling is so vinnig, dat daar gepraat word van drie generasies geheue tegnologie in ses jaar met een van die jongste aankondigings IBM se 64K geheueskyfie. Mikro-rekenaars is tans 'n oplossing op soek na 'n probleem — 'n ander probleem as wasmasjiene, TV-speletjies en intelligente tikmasjiene. Prosesbeheer moet net eenvoudig toeneem en die persoonlike rekenaar gaan binne die afsienbare toekoms in dieselfde prysklas as 'n goeie hoëtroustelsel wees.

Van direkte nut vir ON is die beter en goedkoper rekenvermoë en groot vinnige geheues wat alreeds algoritmiese klem op spaarsamige gebruik van geheueruimte effens outyds gemaak het. As die nodige teoretiese ontwikkelings op *gemengde heeltallige programmering* (GHP) nie uitbly nie, kan ON-praktisyns uitsien daarna dat groot GHP-probleme binne tien jaar op 'n roetinebasis geloop en opgelos word — wat dit vir ON sal beteken hoef ek nie vir u te vertel nie. Die afgelope dekades het die vestiging van rekensentrums by talle ondernemings gesien en nie alleen het hierdie sentrums reeds groot hoeveelhede data versamel nie, maar hulle het die proses van

dataversameling deel van die daaglikse bedryf van baie ondernemings gemaak. Beide hierdie feite is plus faktore vir kwantitatiewe besluitneming en terselfderlyd ook 'n argument waarom ON in die organisasie na aan dataverwerking moet staan of ten minste uitstekende verhoudings moet hê.

In die DERDE instansie is die toestand in verwante en aangrensende vakgebiede vir ON van belang. Gebeure in en die toestand van bedryfsingenieurswese, produksiebestuur, O en M, outomatiese beheer, rekenaarwetenskap en statistiek kan almal 'n invloed hê op die bedryf van ON. Enersyds bepaal dit die tegniese steun en samewerking — of kompetisie — wat die operasionele navorser kan verwag terwyl daar andersyds 'n gemeenskaplike korpus van kennis en tegnieke is wat vir die man in die praktyk beskikbaar kom. In hierdie verband kan ons verwag dat net soos wat lineêre regressie vandag nie meer die uitsluitlike gereedskap van statistici is nie, maar beskikbaar is vir elkeen wat R30 vir 'n rekenmasjientjie kan betaal, net so sal sekere tegnieke wat tans onder ON klassifiseer mettertyd algemene besit word. Dit het reeds met PERT/CPM gebeur en ook met voertuigskedulering en ons kan verwag dat, aangehelp deur die rekenaarrevolusie, nog tegnieke hierdie pad sal volg. Die operasionele navorser moet dit as onvermydelik aanvaar, maar hy moet dit ook verwelkom omdat dit nie alleen die bedryf van ON uitbrei nie; maar ook omdat dit hom vrystel om sy unieke talente toe te spits op nie-standaardprobleme. Nog 'n verskynsel wat waarskynlik kan realiseer is dat ON-tegnieke in sommige bedrywe sal vestig as beroepe soos wat bv. reeds gebeur het by SASOL waar daar al vir etlike jare die posbeskrywing "lineêre programmeerder" bestaan.

A FOURTH and very important factor is the attitude of managers, administrators, senior military officers and other decision makers towards OR. The decision maker's attitude is formed mainly by what he is told about and what he experiences of OR. Unfortunately, in the past many of us oversold OR, not so much in our description of the product, but in the time we allowed ourselves to produce this custom-made commodity. More fortunately we have now reached a stage where managers and administrators, especially those who are graduates of business schools, have at least an understanding of what OR can do and what not. Not only is it no longer necessary to sell OR to these people, but it is also possible to make them understand that quick answers are mostly dirty answers and that OR people are knowledge workers and problem solvers who cannot be expected to crank out answers in the same manner as clerks writing letters or essayers analysing rock samples. Most worthwhile OR tasks are non-standard and involve the research part of operations research.

Closely related to the attitude towards OR is a FIFTH aspect which is the availability and quality or OR personnel. Often a manager's one and only experience with OR is an unfortunate past experience with one particular person claiming to be an OR professional but whose training and ability was so sadly inadequate that the manager was evermore put off. Although the OR Society has in the past expressed its doubts about the desirability of the registration of scientists, the proposed act does hold promise of giving us the machinery to weed out similar practitioners who do OR considerable harm.

Also on the positive side for OR is the fact that more and more OR courses are being taught at South African universities, both at undergraduate and at postgraduate level. This takes place in allied departments such as those of statistics, applied mathematics and computer science, and creates a pool of people from which future OR specialists can be drawn. Unfortunately, this pool of people is far too small and, what's more, most of these people will probably gravitate to the perceivably more highly remunerated field of data processing. Although they may be inadequate in number and it may take some time before these new graduates gain the experience and attitudes one expects of OR people, the average quality is going to be higher than that of the OR pioneers as a group, who often had no formal training in OR at all. While the established

operations researchers should welcome the new graduates into the job situation, and try to help them over their initial lack or experience and confidence, we should not neglect our reading, always remembering that an operations researcher with a practical bend cannot fail to benefit from knowing more OR techniques, more statistics, more accounting, more tax law and more computer science. I shall never be convinced that a course in, for example, automatic control can in any way harm the abilities of a successful operations researcher.

Allow me to digress from the availability of operations researchers in general to the availability of operations researchers at the teaching departments of universities. It is well known that while some academic departments may receive five good applications for each post advertised, others advertise a number or posts and receive far too few applications. The reason for this anomaly is straightforward — the market prices and/or scarcity-values of the teaching commodities differ from each other. The result is that a person with an MComm/CA may find himself professor of accounting, because that is the only way in which the university can offer him a competitive salary, even though university regulations specify that a PhD is the minimum requirement for that post. It often happens that posts remain unfilled when the university's salary is not competitive and this leads to a heavier teaching load which reinforces the unattractiveness of the teaching job. The solution lies not in general increases or in making special exceptions, but in allowing salaries within the university to drift to competitive levels, fixing only the average salary. This might very well result in a situation where a professor of accounting receives more than his colleague in history and where a department of OR can offer its own students a salary which they can afford to take up.

Having peered into the future I wish to conclude by bringing to mind the French saying which claims that the more things change, the more they stay the same. And the essential character of OR will stay the same. Into the eighties OR will remain exciting and relevant while a career in OR will still offer opportunities for personal fulfilment as well as social responsibility. The science and methodology of operations research can be a powerful tool for rational decision making over a large span of problems and for operations researchers the challenge of the eighties is to be as useful, as relevant and as large as our subject. For each of us and also for the OR community as a whole, our success or failure in the eighties lie mainly in our own hands.