

A History of the Government Operational Research Service 1968-1980



Mick Hudson (Member of GORS, 1970-2007)

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Foreword by Tony O'Connor, Chair of the Government Operational Research Service

The origins of Operational Research in the 1930s in the British military services is well-documented and those of us who have joined the profession are very familiar with the names of Patrick Blackett and other pioneers of OR. Several books and articles tell of the projects and techniques used in those times and the influence they had. OR has contributed significantly to the work and policy of what is now the Ministry of Defence ever since and flourishes today.

There is less history about OR in the Civil Service outside the CSD. Yet, there are now 700 analysts in the profession, one of the biggest groups in the Operational Research Society.

I joined the Government Operational Research Service (GORS) while it was much smaller than this but after OR had become established in many departments. I listened to the stories of those with more experience. Recently, I felt that these experiences ought to be documented before they are forgotten. Many of the leaders of the early work have died and those that were junior staff have retired.

I also observed that 1968 was a significant year as it was then that the vision emerged of a network of OR teams across the Civil Service. A central department, the Civil Service Department (CSD), was formed overseeing much of the machinery of government. It included an OR Group with one of its aims to spawn other teams throughout government. That makes 2018 the 50th anniversary of the origins of GORS

Mick Hudson, who joined CSD in 1970, kindly agreed to coordinate research into the early days and has written this account. He was able to contact several people who worked in government OR in the late 1960s and 1970s. Some personal accounts are to be found in Chapter 6, but in addition others have contributed and we have also acknowledged their contribution in that chapter. On behalf of GORS, Mick and I are extremely grateful.

The material is more from recollection than documentation, but we have found remarkable consistency among contributors.

This account covers our history up to about 1980. By then, OR groups had been established in most of the large departments. OR analysts had to overcome scepticism and persuade senior managers to agree to project work. They proved that OR was worthwhile and welcome. The present members of GORS must be grateful for their successes on which they can build and grow.

Of course, history continues, and we plan to add further accounts on how GORS continued to succeed and grow through the different governments from Margaret Thatcher's emphasis on performance measurements and Tony Blair's "Adding it up".

We have not, of course, been able to contact everyone. If you know anyone else who experienced these times, then please encourage them to contact GORS using the template available at <http://operational-research.gov.uk/recruitment/history/> - we would be pleased to add significant individual accounts, interesting additions and corrections.

Tony O'Connor
Ministry of Defence
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Chapter 1 The Origins of GORS: Fulton and the CSD

The Government Operational Research Service (GORS) is a professional network of all OR analysts in central government in the UK. It has a small secretariat, the Central Management Unit, and a committee structure. Its purpose is to promote OR throughout government, and to ensure that posts are filled with skilled, knowledgeable and effective analysts. Much of the work of GORS concerns knowledge sharing through conferences and other events, recruitment, career development and co-operation with other analytical disciplines such as economics, statistics and social research.

A measure of GORS success is that now most, over 25, government departments and agencies have OR analysts. Where there are none, GORS still aims to establish an OR presence.

This document will concentrate on the period 1968 to 1980. Much high-quality Operational Research happened in the years before and since, but we can trace the vision of OR teams thriving across the whole of civil government to events in 1968. By about 1980, viable OR teams had been established in the bigger departments and certainly in hindsight OR had proved to be sufficiently valuable to remain with permanence.

So, we mark 1968 as our date of origin. Several things happened or started at or about that time, which had the aim of establishing a network of OR groups throughout civil government. There was a vision for them to co-ordinate and co-operate. These were

- The publication of the Fulton Report and the establishment of the Civil Service Department (CSD) into which a significant OR resource was deployed.
- Support from the OR Society.
- The enthusiasm for OR (and other analytical professions) by the Cabinet Secretary, Sir William Armstrong.
- The recruitment of Ken James from the Defence Operational Analysis Establishment, initially to the Treasury and then to head the CSD OR group.

However, there would be nothing to celebrate without success. Some key factors were:

- A history of successful achievements by OR before 1968, in the Home Office and elsewhere.
- Some very assertive promotion of OR in the 1970s, particularly by Ken James and Maurice Shutler.
- Success in project work to fulfil the promise. Some were high level; others less so, but often achieved notable savings or gains in effectiveness.
- Effective, arguably shrewd, use of external skilled OR consultants and some academics.
- The establishment of an interdepartmental OR committee, initially a subcommittee of an interdepartmental management services committee, with subgroups for recruitment and training.
- The camaraderie which developed amongst the OR personnel

Operational Research in Government before 1968¹

As is well-documented, Operational Research had its origins in the military in the late 1930s, was successfully used in World War II, and by 1968 was very well-established in the Ministry of Defence.

After the war, there were attempts to establish OR teams in some civil government departments with varying success, but any co-ordination at that time would have been ad-hoc and informal.

The more successful teams seem to have been established at the Building Research Station, which lasted from the late 1940s into the 1990s, and in the Home Office.



Professor Patrick Rivett on BBC2

In July 1964, the BBC broadcast a series of three programmes called *“Basis for Decision: The Use of Operational Research”*. They were anchored by Professor Patrick Rivett, then of Lancaster University, and some prominent members of the OR Society, including Stafford Beer, Sir Charles Goodeve and the president Professor G A Barnard took part.

These programmes gave several examples of successful OR projects in the coal and steel industries, manufacturing, retail, local government and health.

The work for the National Coal Board was endorsed by its chairman, Lord Robens, who said Operational Research had saved the board many millions of pounds.

Towards the end of the third programme there was a discussion on the future of OR, and this lamented the absence of OR in civil central government, both at the executive and policy level.

Early OR in the Home Office

In 1962, the Home Office Police Research and Development Branch (PRDB) was set up and staffed by a mix of serving police officers on secondment and scientists. It later became known as the Scientific Advisory Branch. The Director was a retired Chief Constable who was an HMI - Her Majesty’s Inspector of Constabulary. The deputy director was Alex McDonald, a scientist with experience in the Ministry of Defence.

Under Alex McDonald, there was a thriving OR team led by Peter Turner and including Ross Tristem and Richard Gibbs. Vincent Watts was brought in for a time as a consultant under contract with Arthur Andersen.

¹ M W Kirby *“Operational Research in War & Peace”*, London, Imperial College Press
M W Kirby & R Capey (1998) The origins and diffusion of operational research in the UK, *Journal of the Operational Research Society*, 49:4, 307-326

Projects included:

- **Unit Beat Policing** (which one might associate with Panda cars and Z cars). This was led by Peter Turner and begun with experiments which tested how effective was the “bobby on the beat”. Resources were increased by up to tenfold. Sadly, for the ‘Bobbies’, they showed that such policing had a minimal impact in reducing crime.

A new approach was developed on the belief that policing needed to be fast, co-ordinated and targeted and that meant cars and radios. Further trials then proved the proposals were effective.



- **Regional Crime Squads** (now the National Crime Agency). These were set up following the Great Train Robbery of August 1963. Proposals for these squads needed proof that they could perform better than the local CID. A measure of seriousness was devised to gauge the relative value of a conviction and which comprised three elements: solving the crime; saving future crime (because, for example, the offender was in prison) and deterring others. Statistical tests showed that the Regional Crime squads were significantly more cost-effective. The OR analysts involved were Ross Tristem and Colin Walker.
- **Computerisation of fingerprints.** Mike Wilmot, a mathematician, worked on this.
- Other projects included command and control issues, traffic control, photofit v identikit, trailing cars and lessons from the “Great Train Robbery”.

One of the special features of the work was that each project was led by an OR analyst and a senior police officer, who had equal status. This ensured that the work of the OR analysts was grounded in a realistic understanding of police operations. It also generated credibility in the Police Service for their recommendations. This reflects one of the success factors of OR in World War II when scientists worked in close collaboration with officers from the Armed Services.

The Fulton Report²

The Committee on the Civil Service, chaired by Lord Fulton, was asked by Harold Wilson to examine the structure, recruitment and management, including training, of the Home Civil Service, and to make recommendations. Fulton gave his name to the committee and its report.

In the first chapter of the its Report, the Fulton Committee stated that the Civil Service of the day was fundamentally the product of a nineteenth-century philosophy; whereas the tasks the Civil Service faced were those of the twentieth century. The Civil Service was found to be inadequate to meet those tasks in six main respects.

- The Civil Service was essentially based on the cult of the “amateur” or, to be fairer, the generalist.

² *The Report of the Committee on the Civil Service, Cmnd 3638 (June 1968)*

- The system of occupational “classes” impeded the work of the Civil Service. For example, in Science there was the Scientific Officer Class (the brainy ones), the Experimental Officer Class (who set up experimental equipment) and the Scientific Assistant Class (who washed up the test tubes). The Fulton Committee was critical of the too rigid classification system, which made it difficult for staff to move among the various classes, and limited departments’ ability to place suitable people in posts. The Committee also took the view that the word “class” in 1960s Britain had developed social connotations which could produce feelings of inferiority. As an alternative, the Committee proposed occupational “groups” and “categories”, together with a simplified pay structure.
- Many scientists, engineers and other professional specialists were not given the responsibility or authority they deserved. The Committee therefore recommended that these specialists be given more policy-making and management opportunities, and training to equip them for their new work. The Committee recommended the creation of a new Civil Service College to provide this training and to meet the other training needs identified in the report.
- The Committee considered that the Civil Service lacked skilled and accountable managers. One reason for this was that most of the work of most Senior Civil Servants was not managerial, but rather related to matters such as the preparation of explanatory briefs and answers to parliamentary questions. To improve management skills, the Committee recommended that administrators should become more specialised, and more training in management should be given to scientists and specialists. To improve management even further, the Committee also recommended the establishment of a new Civil Service Department (CSD) and the creation of a management services unit in each department to promote new management techniques. That included Operational Research.
- The Committee considered that there was not enough contact between the Civil Service and the rest of the community. The Committee therefore recommended greater openness in Government, less anonymity for officials, and greater mobility of staff into and out of the service.
- The Committee took the view that there were major defects in human resources management, which was also to be addressed by CSD.

The Civil Service Department³

One of the questions which the Fulton Committee addressed was whether the Treasury was the right Government department to exercise human resources responsibilities within the Civil Service. Should recruiting policy and management remain the concern of a department whose primary responsibility was for finance? The Committee concluded that the Treasury's management role had been "patchy rather than systematic, with too few staff and too little expertise". The Committee accordingly recommended that a new government department should be established straight away, with responsibility specifically for the Civil Service. The Committee also expected that the new Civil Service Department (CSD), once established, might be responsible for the implementation of the Committee's other recommendations.

CSD was accordingly established on 1 November 1968. It took over the recruitment responsibilities of the Civil Service Commission, and the responsibilities of the pay and management divisions of the Treasury. 900 Civil Servants were transferred from the Treasury and Sir William Armstrong, who was the Joint Permanent Secretary of the Treasury, left the Treasury for CSD and became the new Head of the Civil Service.

An OR team, headed by Ken James, was placed within a Management Services directorate with disciplines such as Organisation and Methods. By 1970, it had recruited about 20 Operational Research Analysts and used several consultants.

The Civil Service Department continued under both Conservative and Labour governments but was dissolved in December 1981 when the Thatcher administration introduced a less centralised machinery of government and greater outsourcing. For example, pay regimes became the responsibility of departments and there were no common pay scales.

CSD's functions were split between the Treasury and a new Management and Personnel Office (MPO). The MPO was assimilated into the Cabinet Office in 1982.

The CSD OR team moved to the Treasury, but by then had spawned an OR presence in several civil departments and a committee had been formed of the heads of the OR profession from departments with an OR resource and there were subcommittees for training and recruitment. Conferences, courses, events and social activities were being organised to encourage OR analysts to make contacts and friends and to share knowledge. Recruitment was shared across civil departments. What we now know as GORS had taken shape.

The Civil Service College was created under the CSD's direction amid dreams of a British version of the Ecole Nationale d'Administration. It was expected that a great deal of college training would be needed, and there were therefore to be three training centres: two residential (one at Sunningdale and one in Edinburgh), and one non-residential (in Victoria, London), which were opened in 1970.

Central management training in the Civil Service increased by nearly 80 per cent. This included twice as much training for all groups at Grade 7. In total, about 8,000 Civil Servants attended courses at the College in that year. In addition, considerably more use was being made of external courses, held, for example, at universities and business schools. By 1970,

³ M W Kirby *"Operational Research in War & Peace"*, London, Imperial College Press

well over 200,000 Civil Servants were receiving formal training in their departments and in the same year 25,000 Civil Servants attended external training courses ranging from first degrees to short seminars of two or three days' duration.

The College has its place in our history, especially in the 1970s and 1980s as it hosted conferences and ran courses both to teach technical knowledge and to develop competencies such as consultancy skills, project management and presentation.

However, the college gradually lost the interest of ministers and senior civil servants and reduced in scale. The Conservatives made it an executive agency and considered outsourcing it to a university. Under Tony Blair, the college became part of the Centre for Management and Policy Studies, before it became the National School of Government (NSG). GORS looked elsewhere for conference venues and for courses.

NSG closed in 2010, but in 2012, an organisation was formed and acquired many of the trainers and training programmes that were previously offered by the school. It is called the Civil Service College!

Most of such training is now delivered by Civil Service Learning (CSL) which is part of the Cabinet Office. CSL provides learning and development for all civil servants and much of it is on-line.

The OR Society

Fulton provided the OR Society an opportunity to promote the cause of Operational Research, and its council decided it should give evidence to the committee. A memorandum, drafted by Rolfe Tomlinson and Tony Flowerdew, was presented to the committee by the president of the society, Roger Eddison.

The society recommended the creation of a central group to contribute Operational Research resource to national and regional planning problems, and to contribute to problem solving at departmental levels. They recommended its location in a central government department or a special agency.

Sir William Armstrong

Operational Research had a good friend in Sir William Armstrong. He was very enthusiastic about OR which he believed could achieve a lot in the Civil Service and encouraged the analysts in CSD to take every opportunity.

Sir William was a career civil servant, who had risen to become Joint Permanent Secretary of the Treasury in 1962, and then, the first Permanent Secretary of the Civil Service Department in 1968 and Head of the Home Civil Service. He retired in June 1974, and later joined Midland Bank as its chairman. On 29 January 1975, he was created a life peer with the title Baron Armstrong of Sanderstead.

Sir William's Treasury had recruited an Operational Research analyst in 1965 (T S Billinger) and in 1967, the leaders of



Sir William Armstrong 1975

department's Management Services Division went on a fact finding visit to the Defence Operational Analysis Establishment. They were sufficiently persuaded of the value of OR to recruit the establishment's deputy director, Ken James, to the Treasury's O&M Division.

Ken arrived in time to join Sir William at a meeting to discuss the OR society's memorandum with Roger Eddison, Rolfe Tomlinson and Patrick Rivett. Since he had become convinced of the value of OR, this was a very successful meeting and a key step in the establishment of a strong OR group in CSD. This outcome was more or less what the memorandum recommended.

Ken James⁴

Ken James moved from the Treasury to lead the team in CSD, which was part of the Management Services Division – MS(OR).

Before he took up OR, Ken was a chemist and spent several years in pure science research within the defence field. He was drawn into the assessment programmes so typical of much early OR activity and recognised the potential for using such methods in more strategic decision making. His work within the defence field following World War Two gave him the opportunity to develop these ideas and to see the results of his work having a real influence on matters of importance.



Ken James

As Director of the Army OR Establishment within the Defence Operational Analysis Establishment, Ken became more aware of the desirability of using similar methods in analysing the complex problems of Central Government and he brought this vision and energy to the Organisation and Methods (O&M) Division of Treasury, and later in the Civil Service Department.

Ken was well supported at a senior level in CSD, recruiting Peter Turner from the Home Office; Tom Easterfield, who had worked in some of the other efforts to use OR in civil departments⁵; Bernard Bishop, who practiced OR in British Rail; and later Maurice Shutler from the Prices and Incomes Board, Brian Smith from a consultancy and, on promotion, Bert Benham. By October 1970, following significant recruitment during the summer, there were about 20 analysts, plus consultants and support staff.

Operational Research Camaraderie

⁴ M W Kirby (2003) *Operational Research in War & Peace*, London, Imperial College Press

Daily Telegraph Obituary 4 February 2011)

<https://www.telegraph.co.uk/news/obituaries/8303707/Kenneth-James.html>

⁵ T E Easterfield (1983) The Special Research Unit at the Board of Trade, 1946-1949, *Journal of the Operational Research Society*, 34:7, 565-568

One strong feature, recalled by several contributors, was the friendships which developed amongst the OR personnel and continued after we had all gone our separate ways, and this was a major factor in driving the success of OR in Government. The intake in 1970 were made to feel very welcome and soon there was a good feeling of being part of a bigger team.

These recruits all believed that they represented a bright, young and new creative force helping to quantify and solve any government problem - the more difficult the better. For those who went on to the Treasury, the experience became even more intense, as they soaked up the powerful atmosphere there, and felt at the heart of policy making in government.

There was a strong culture of sharing problems and consulting team-mates for their technical knowledge. Much of this was informal, but organised seminars were also enjoyed.

Graphs were drawn with coloured pencils and visual aids were prepared for talks on flipchart paper.

Computers were used, programming mostly in Fortran and Basic and analysts talked in K, both for processing power and data storage, and had not heard of mega let alone giga or tera- bytes. They used time-sharing computers with teletype terminals, prepared programs on paper tape or punched cards and sometimes work was crashed by the telephone operator who was worried about the time one spent on the modem (which was the size of a suitcase). A terminal would be shared by several analysts who needed to book time. There was much excitement in CSD when a new teletype was delivered that doubled contact speed to 16 characters per second.

In Lambeth Bridge House, the teletype terminals were all together in a small office in which the large single-glazed metal-framed windows were kept closed in a valiant attempt to maintain the temperature. Unfortunately, the most frequent users were chain smokers.

Colleagues tended to share useful subroutines, for example of statistical techniques, and tricks to make the best use of the limited space.

If they wanted anything typed, they had to send hand-written material to the typing pool, and the turnaround time was usually days. The alternative was to beg a favour from the boss's PA. Mistakes needed more re-typing, or one made do with manual corrections. Typists were always on the critical path!

There was, of course, much socialising in Westminster pubs and parks, and one observation of Operational Research analysts was that "they play more games". These gatherings were, however, rather "bloke-ish" involving beer, darts and football. Even so, some friendships led to weddings.

There were some more organised meetings with an outside speaker, designed to spark debate and develop a sense of camaraderie. Alan Berresford was at one time responsible. Sir William Armstrong attended such a meeting in February 1972.

It is striking, but not surprising for those times, how few women were employed as OR analysts in the earlier years of our history. There were also comparatively few from ethnic minorities. All the senior people were white males.

However, in the 1970s Home Office, there were at least 3 female Grade 7 team leaders - Patricia Morgan who had years of experience in OR for prisons, Janet Thompson who moved

out of OR into policy and at one time was head of the forensic science service, and Jane Hogg who did fire service OR, then moved to civil defence and police before taking early retirement. Of ethnic minorities, Chan Himatsingani was a branch head in the Department for Health and Social Security (DHSS).

The earliest female leaders include Sue Rice as acting head of the HM Customs & Excise OR group for a short time in the mid-1980s, then head of the Export Credits Guarantee Department group. Sue Merchant was head of the Metropolitan Police group around the same time.

As one might hope and expect, the proportion of women and ethnic minorities applying and being recruited to GORS, has now increased close to parity. More have also become departmental heads of profession.

As Operational Research Groups were spawned in more departments, events became more organised, but developing contacts and friendships was a stated objective of the programme of conferences, seminars and social occasions.

The Use of Consultants

Most of the OR groups used consultants. Whilst expensive, compared to Civil Servant OR analysts, they were low-risk in the short-term as they were on temporary contracts. However, if their work proved lasting, their replacement by cheaper, permanent analysts was a cost saving! Then the extra demand for OR work led to their being re-engaged!

For example, Arthur Andersen were engaged by the Home Office. PE Consultants were involved in HM Customs & Exercise for VAT planning. There was also a substantial amount of Institute for Operational Research (IOR) work for the DHSS on the balance of care model. Other consultants included Martin Beale, National Coal Board OR unit, Scicon and some universities.

The Institute for Operational Research had a long-term contract for a fixed price to provide support as and when required to CSD. This covered about 5 people full time across central Government. (IOR was established on 1 May 1963 as a semi-autonomous unit of the Tavistock Institute of Human Relations, which provided an administrative and spiritual home for the new research institute. The idea was originated within the ORS by Neil Jessop who became the first Director and Sir Charles Goodeve was first chair of the IOR advisory committee. In 1973, IOR agreed to an internal merger with a group of social scientists from Tavistock. In 1979, this inter-disciplinary unit adopted the title Centre for Organisational and Operational Research (COOR). COOR disbanded in 1985.)

In 1977-9, the consultants Arthur Young (now EY) developed an interactive pay bill model for the CSD. There are some more examples below, and others forgotten.

All worked very closely with Civil Servants either remotely or in the office.

Chapter 2 Civil Service Department OR Projects from 1968

From 1968, CSD was in Sanctuary Buildings, Great Smith Street, Westminster, but in the early 1970s, it moved to the Old Admiralty Building near Trafalgar Square. Neither could be described as prestigious accommodation, but geographically, they were at the heart of government.



Sanctuary Buildings

The OR group was part of the Management Services Division and often known as MS(OR). Ken James was head of MS(OR) from 1968 until he retired in 1977.

Peter Turner then took his place and led the group through to the closure of CSD in 1981 and the transfer of all the staff to Treasury.

The OR group undertook a portfolio of projects, some strategic, some tactical, some big, some small, some with high level clients and some lower down the hierarchy, perhaps to Grade 7.

This chapter will describe some examples.

Selective Checking of Invoices

Her Majesty's Stationery Office (HMSO) in Norwich had a large administrative operation for checking invoices from contracted printers who had produced material commissioned by Government. When submitting the invoices, the printers were required to send a sample of the work that had been commissioned and this was checked by a team of qualified printers employed by HMSO.

There was a vast range of printed material and John Corneille and Roy Riddett assessed whether the money saved by checking all invoices was worth it, taking account of the cost of checking and error rates. In fact, the work demonstrated that it cost more to check all invoices below a certain value (the checking bar) than was saved. The recommendations were accepted, and a checking bar introduced, along with a statistical based sampling scheme for invoices of value below the checking bar to ensure that error rates did not change through time.

This is an example of a seemingly less glamorous project, which took a few months to complete, but it resulted in demonstrable savings in administrative costs and so helped prove the worth of the OR group.

Location of Government

The Civil Service Department OR group was involved in the Location of Government study. Sir Henry Hardman had been commissioned to look at the possibility of dispersing more government work from London, both to save money and to contribute to regional policy. Part of the benefit came from providing employment in the receiving location, and the study involved estimating such exchequer effects as reductions in unemployment payments. In those days it was compulsory to include such exchequer effects. (Later, with attempts to make government more like businesses, it became compulsory to exclude them.)

Hadley Hunter, Brian Smith and other consultants from the Institute of Operational Research joined analysts from MS(OR). There were two principle roles for IOR on this project. The key one was devising and carrying out a study into the patterns of face to face communications within and between staff in government departments and with others outside. The other was to develop a model to analyse the communications study's data and generate options for dispersing different numbers of government jobs to locations throughout the UK.

Considerable effort went on the study which contributed to the 1973 Hardman report⁶. Parts of this were implemented in a rather ad hoc way. The OR methodology was developed from scratch and involved several streams:

- Categorising the whole of Civil Government into block of work roughly headed by an Assistant Secretary (Grade 5) and a similar recording of external contacts at a location level;
- A communication survey with questionnaires for HEO-Assistant Secretary and interviews for senior staff (Deputy Secretary and above) to estimate the number of annual contacts for each block of work with other blocks of work;
- A model to evaluate the communications damage of broken links (either travel or lost efficiency) for different allocations of blocks of work for a department to locations;
- A telecommunications study to evaluate the costs and benefits of audio and video teleconferencing (then in its infancy);
- An economic study to consider exchequer and resource costs and evaluate the costs of travel and relocation in different possible locations;
- A behavioural study on private sector experience and factors affecting staff attitudes to moving;
- Negotiation between Sir Henry Hardman and Permanent Secretaries to agree compromise splits; and
- A second model to evaluate possible overall allocations of departmental sections to preferred locations to get right overall number of jobs dispersed.

In retrospect the methodology seems overcomplicated given the political constraints but may have been necessary to ensure that departments felt that the OR team had understood them.

Decimal Coinage

MS(OR)'s client here was the Royal Mint, which needed to decide how many new coins to mint and where they should be on "D Day", 15 February 1971.

Pennies mattered more in 1971 than they do today. A pint of beer would cost a little more than two shillings (10-15p) and a few copper coins would pay for a bus ride. Most day-to-

⁶ *The Dispersal of Government Work from London*, Cmnd 5322 (June 1973)

day spending was paid in notes and coins.

A key part of the study was a survey to find out where coins were and how they flowed through the system. People are not very rational with coins. Many are hoarded at home in piggy banks or tins, often without reason. People often seek change when they need not, presumably wishing to keep a stock of coins in their pocket or purse "just in case". Millions of coins are lost. In terms of flow as decimalisation approached, shops withdrew cash from the banks to stock their tills for change, but coins flowed back into the banks from transport.

In the weeks after D Day, businesses needed extra coins to replace the old coins they were withdrawing. Even bus conductors needed the new coins during the transition, so they could give change.

Phil Jones, Alan Hawley and John Corneille modelled this and calculated how many coins needed to be with each sector and therefore, how many needed to be minted. In the event, the Mint produced a few more, but the OR estimate would have been comfortable. Without OR, the Mint would have spent considerably more minting unnecessary coins.

Ordnance Survey

In 1970, consultants had developed an excellent planning model for Ordnance Survey in Southampton. As it was written in Fortran, it needed an OR analyst to run it and Ron Ladley was recruited to do this. The question of how to ensure models continue to be used once the systems were implemented became a big issue for the CSD OR group.

The model itself covered the resources required for aerial survey and re-survey of the whole of Great Britain, together with the need to revise continuously a growing number of existing maps, and then to draw the maps themselves, all within 10 years - hence it was called the 1980 Plan.

Government Computing

CSD Management Services also had a Division charged with introducing more computerisation into central government. This was the forerunner to the Central Computer Agency (CCA) which eventually became the Central Computer and Telecommunications Agency (CCTA). CCTA also had responsibilities as a central procurement body for government technological equipment.

CCTA's work during the 1970s, 1980s and 1990s was primarily to develop central government IT professionalism, to encourage the take up of opportunities to use IT to support policy and to encourage and assist UK private sector companies to offer services to meet government needs.

In the 1970s, John Corneille worked with a team of administrators charged with the long-term planning of computerisation across government. They were evaluating different strategies, considering the extent to which a centralised approach should be taken (for example, for specific functions like payroll and personnel) or alternatively adopting a more devolved approach by Department. A dynamic programming model was developed to evaluate different strategies. This was not particularly successful in coming up with any clear answers although it did help to clarify some of the alternatives.

The work led to involvement of another aspect of the planning team's activities. This was to decide the size of computers needed to fulfil specific requirements for automation. At that time everything was being undertaken on large expensive mainframe hardware and the correct sizing was important in managing costs. Sometime before a complex, hard-to-use simulation system had been purchased. MS(OR) was asked to investigate whether there might be better ways to assess sizing requirements and John was able to identify simpler approaches to simulating computer systems that were appropriate in some circumstances.

Pay Modelling

In the 1970s, civil servants were on incremental pay scales. When recruits joined, they usually started on the bottom rung of the scale and moved up an increment at every anniversary until they reached the maximum. They would also receive a “cost of living” pay rise annually following a review of the pay scales. The review was undertaken by CSD and negotiated with the trade unions.

It had been observed that the actual average pay did not simply equal last year's average pay uprated by the average percentage “cost of living” pay increase. During the 1960s, it had usually crept upwards, so the phenomenon was called “Creep”.

To tackle the 20%+ inflation of the time, Edward Heath's government introduced a pay policy. CSD were concerned that they could not simply implement the permitted percentage rises, if Creep meant that on average, civil servants would get more than was available to others under the policy.

Mick Hudson was able to collate good data on the numbers of people on each increment and figures on recruits, promotions, resignations and retirements. He designed a model which made a calculated estimate of next year's numbers and thus made a forecast of the relative pay bill. The figurework was done by hand on “analysis paper” - A3 size sheets with several rows and columns. Mick's work was checked by a sandwich student.

The model covered the administrative and clerical grades from the most junior Clerical Assistant to Principal (Grade 7) which was most of the civil service. The calculations gave a Creep of less than 1%.

The work also explained Creep. Intuitively, people expected no Creep if numbers were steady, and to occur if numbers are falling or rising. It is more dependent on the rate of change. Post war, the civil service had grown, but this had slowed down so there were fewer recruits to offset people heading for the maximum.

Dozens of GORS people have modelled pay systems since and followed similar methodology although automatic pay increments have largely disappeared.

Management Reviews

MS(OR) worked on several projects in the programme of Management Reviews of government departments. Many of these were supported by consultants from IOR, whose reputation had been enhanced on their work on the Location of Government project. These included Brian Smith, whom Ken James persuaded to join the civil service and accept a post as an SPSO in CSD.

Brian led a successful review of the Immigration and Nationality Department's operations in the Home Office. Maurice Shutler led a review with Alan Berresford of MOD procurement, which was run by a 4-star admiral. They made a couple of interesting findings on budget and project duration over-runs.

Chapter 4 Growth of OR in other departments

The Fulton Report recommended that each government department should have a planning unit. Ken James persuaded Sir William Armstrong that an aim should be to include Operational Research as a component to each such unit.



Maurice Shutler

So, Ken set about seeking to introduce OR into every department. From 1971, he was assisted by Maurice Shutler, who became a key player in the establishment of departmental OR groups.⁷

Maurice and Ken held many meetings with senior civil servants, and clearly met with opposition. More junior staff had similar experiences with sceptics of this “modern management nonsense”. However, they often found problems that might benefit from an OR approach and persuaded people to let an OR analyst try to resolve the issue. The reward of good work is more work, and eventually enough to justify small teams in some areas.

In 1970, Edward Heath became prime minister and his Conservative government dropped the idea of central planning units. Instead, they instituted “management reviews” and Maurice and Ken promoted OR as useful for this vehicle instead.

Later, OR followed the interest in performance measurement under Margaret Thatcher and especially the “Adding it up” initiative of Tony Blair.

The following accounts try to tell the stories of how departments started and grew. By no means all are down to Maurice and Ken, but there is a common theme of good, creative, hard work by OR analysts at all levels.

Home Office

In Chapter 1, we outlined OR work that was done on police issues before the establishment of the Civil Service Department. This, of course, continued.

There was also some OR activity on some of the other responsibilities of the Home Office. The Scientific Advisory Branch, or its equivalent, had existed since World War II, initially focusing on civil defence, then moving into work for prisons and later the fire service.

In 1968, Peter Turner moved from the Police Research and Development Branch to the Civil Service Department and in 1970, Alex McDonald (generally known as Mac) left to set up a new OR team in the Department for Health and Social Security, and Richard Gibbs and Ross Tristem soon joined him. Unfortunately, Mac was replaced at the Home Office by someone who was not interested in OR.

When Margaret Stringer (nee Ball) joined in 1973, each of the teams had an OR sub-section, headed up by a Grade 7. There was no overall head of OR until Sid Butler joined from MoD in around 1975, but he had no OR background.

In the 1970s, significant projects included designing a large sample survey system for recording accidents in the home which resulted in treatment by GPs, A&E or in a fatality

⁷ Interview of Maurice Shutler by George Mitchell, January 1994

recorded by Coroners.

Margaret was also involved in the development of the Police National Computer Unit which was responsible for computerising the criminal records collections held by police forces and used for identification purposes. In the 1970s, computing storage and processing power were limited and expensive, so one of her tasks was to estimate the storage capacity and access required for stolen vehicle records.

Phil Stringer joined in 1974 and his analysis and modelling focused on two main areas of systems design - record storage and database query - as police forces needed very fast response times. He was involved in file design optimisation and the design of search algorithms to cope with incomplete or inexact information in the query.

Modelling of storage mechanisms enabled the optimisation of file design parameters - in those days hashed random access files - to ensure even distribution of records. Searching algorithms were developed using statistical techniques - linear discriminant analysis of samples of known matching and non-matching records. Principal component analysis was also tried. Algorithm performance was evaluated using sample enquiries against the database to estimate search reliability and response times. Sue Rice joined in 1975 and worked on immigration, a new area for SAB, building on work by consultants from the Institute for OR. Projects included some forecasting models and ideas about improving administration. Most of her work involved updating these models and identifying further efficiencies. Middle managers in Croydon were sceptical of young people 'telling them how to do their jobs', but OR probably successfully introduced the idea of using evidence and data to inform decisions.

In the late 1970s, work on magistrates' courts was a new area for OR. Sue was initially involved trying to assemble any data at all on court operations, including copying information by hand out of court registers and designing and running a survey of court resources. She was tasked with reviewing court delays and fine enforcement.

By now the OR parts of SAB had been amalgamated with the HO Research Unit allowing collaboration with criminologists and other social scientists. With Hugh Pullinger, Sue developed a model of the criminal justice system. This was a large project with a proper steering committee and involved separate teams working on police, courts, and prisons, as well as a 'flow model' to link them together.



The individual strands were all very productive, but unfortunately each team went its own way and they were not consistent. Some consultants (possibly helped by CSD people) built an ambitious systems dynamics model of the police part of the system and other teams built a magistrates' courts resourcing model; the Crown Court part morphed into work on introducing computers to courts; and the prison part mainly used existing forecasting models.

Other OR Analysts involved were John Harwood, John Macleod, George Carr-Hill; John Stealey; and Ian Williamson.

Department of Health and Social Security



Ray Jackson advocating appointments systems for GPs in the BBC programme "Basis for Decision" July 1964

As mentioned above, DHSS set up an OR group in 1970 under the leadership of Alex McDonald (Mac) who moved from the Home Office with some of his staff. He also recruited Ray Jackson, who had done some successful work on appointment systems⁸. Ray (by then Professor Jackson) later led the Clinical OR Unit at UCL, which is still going strong.

In his quest to establish OR, Ken James had found considerable interest from the Secretary of State, Keith Joseph, and his advisor, Professor Alan Walters, so it was relatively easy to establish the group. Both remained involved in the work while the minister remained in post

and Mac and his staff enjoyed support and regular meetings.

The first project to have an impact on DHSS policy was the question of how big hospitals should be and was led by Ross Tristem. Clinicians favoured hospitals with thousands of acute beds, but OR showed that the optimal size was much smaller and recommended that District General Hospitals should have between 450 and 900 acute beds. The minister, Keith Joseph, was very interested and following the analysis announced in the House that the department would not build very large hospitals. A key success factor was team working with other professionals (eg architects and economists) so that the final recommendations enjoyed support from the DHSS professional community.

Another key project from the early 1970's was the "Balance of Care" model, which aimed to match different categories of people needing care to possible modes of caring for them (for example, inpatient care, day care, community care) and made ingenious use of mathematical programming⁹. Ray Jackson oversaw the early work, succeeded by Richard Gibbs, who reviewed and developed variants of the model. Geoff Royston, who joined in 1975, worked with Tom Bowen and Paul Forte on simplifying the model into a spreadsheet version for wider local application. Opportunities for the model to influence policy at national level were limited - and not all who worked on the various stages of the project were agreed on the extent of the limitations - but proved greater at local level. Nearly 40 years on, the basic conceptual approach is still going strong – Tom and Paul are still using it!¹⁰

⁸ R R P Jackson (1964) Appointments Systems in Hospitals and General Practice: Design of an Appointments System, *Journal of the Operational Research Society*, 15:3, 219-224

⁹ A G McDonald, G C Cuddeford, E M L Beale (1974) Balance Of Care: Some Mathematical Models of the National Health Service *British Medical Bulletin*, 30:3, 262-270, <https://doi.org/10.1093/oxfordjournals.bmb.a071213>

D Boldy (Ed) (1981) *Operational Research applied to Health Services*, Croom Helm, Chapters 3 and 4

¹⁰ <http://www.balanceofcare.co.uk/index.html>

The DHSS OR group were closely involved in the work in the mid-1970s to establish a formula (RAWP) for allocating NHS finance to Regional Health Authorities (and OR analysts were again heavily involved – leading a multi-disciplinary analytical team - in the mid-1980s when the formula was reviewed).

Another project from that time was on modelling trials of cancer treatments (an unusually clinically-focussed project for the DH OR group), work that would lead to the creation of the Research Centre for the Mathematical Modelling of Clinical Trials, at Warwick University and, in 1983, to the establishment of the Clinical Operational Research Unit at UCL, now in its fourth decade.

For later years, Geoff Royston's paper¹¹ "One hundred years of OR in Health" contains some relevant material on Department of Health OR projects.

On the Social Security side, OR work was often closely connected with the operation of the huge network of local offices which (unlike the NHS) were a part the DHSS. For example, in the early 1980s the OR group argued that the department needed to run a randomised control trial in representative sample of its local offices to obtain a reliable estimate of the impact of efforts to reduce social security fraud. All sorts of objections were raised about how such a trial was both undesirable and impractical. Eventually the issue went up to ministers and Rhodes Boyson said that it was about time we had a reliable answer to the question and the trial should go ahead! None of the predicted difficulties with trial materialised and it yielded a useful result.

HM Customs & Excise

In 1970, MS(OR) were charged with developing a strategic resource allocation model. Although Phil Jones, Mick Hudson and later Ron Ladley and Andrew Holt did much useful research, the model as such was not very useful, except perhaps in having a sounder basis for costing.

However, at the time, the UK was planning to join what became the EU, and so needed to replace the tax on sales, Purchase Tax (PT), with Value Added Tax (VAT). PT was applied at the wholesale level, but VAT was to apply throughout the trading network, so many more traders would be submitting returns and payments.

Maurice Shutler found that the planners were worried about backlogs, but just guessed that extra resources were needed. Mick wrote VATSIM, a simple simulation in Basic that calculated the times returns waited before they were processed, and the time staff were waiting for new work. The model was run for several resource assumptions.

When they saw the results, the planners decided that they did not like people being paid good money to be idle and that the delays in processing were tolerable, but they wanted more detail.

Further work, using more sophisticated software, on the process led to considerable savings on the original plans. PE Consultants used a system called HOCUS (Hand or Computer Universal Simulator) for the model. The initial analysis involved building a paper model of

¹¹ G Royston (2009) One hundred years of Operational Research in Health—UK 1948–2048, *Journal of the Operational Research Society*, 60:sup1, S169-S179

the total system which covered a huge floor space. Having a physical model of the system, which could be shown to non-technical clients, had a big impact on building understanding and confidence in results.

Other projects helped to persuade the department to recruit its own Operational Research staff in the mid-1970s. This was led by Peter Crookes, supported by Grade 7s Andre Hare and Roger Tilley. Celia Glass and Chris Talbot were also recruited.

A notable project of the new group was a statistical analysis of VAT irregularities. Roger and Chris devised an increasingly sophisticated risk-based strategy for guiding the local office visits-to-businesses programme. The more focused information increased the success of tax inspections and of the revenue raised and encouraged future compliance. Despite some scepticism in local offices, the work was a great success and similar analysis continues today. It must have brought several billion pounds to the exchequer over the years that would otherwise have gone unpaid.¹²

In the 1980s, on the customs side, OR modelled the processing of imports and exports at ports, post-implementation reviews of various IT systems, analysis of the impact of introducing recorded interviews as part of the Police and Criminal Evidence Act, and the OR studies of drug smuggling including developing performance indicators and a systems dynamics model.

HM Treasury

In 1973, 4 or 5 of CSD's MS(OR) were seconded to HM Treasury with offices in the Government Offices, Great George Street, or GOGGS, now also known as 100 Parliament Street. At that time the UK economy was having huge problems with inflation running at around 20% alongside high rates of unemployment. The OR team was positioned in one of the Treasury Division's involved with taking an overall view of public expenditure with a general brief of finding ways in which we could help with forecasting and control.



The OR team was headed by Peter Turner, with Keith Aldred who had led a successful project using linear programming in the Department of Transport on forecasting expenditure on roads.

In 1977, Ross Tristem came to lead the group when Peter returned to CSD on promotion to take over from the Ken James. In 1981, on the closure of CSD, Peter returned with all the staff of MS(OR). Ross then joined the Financial Management Initiative. Peter led the Treasury group until 1985 when Jeff Jones was promoted to take his place.

Working with a large team of consultants from Andersen Consulting who had been employed by the Treasury to review public expenditure control across government. OR

¹² C R S Talbot (1982) Operational Research and the Control of Value Added Tax, *Journal of the Operational Research Society*, 33:10, 885-890, DOI: 10.1057/jors.1982.192

analysts reviewed the processes within the Treasury involved with the annual Public Expenditure Survey (PES) and with the system used for reviewing the effectiveness of specific public expenditure programmes, Programme Analysis and Review (PAR). This work mainly involved suggesting improvements to the way the Treasury reported on PES and PAR through publications to the public and, frankly, was more about applying common sense rather than applying OR skills.

A very significant piece of work that clearly had an impact was developing an improved way of forecasting National Debt Interest. Hitherto, this forecasting had been part of the Treasury macro-economic model, a huge set of econometric equations implemented on the department's own mainframe. Unfortunately, the part relating to debt interest proved to be very inaccurate given the prevailing economic conditions and had been criticised by the IMF. John Corneille developed a separate model which simulated the future stock of government debt based on forecasts of borrowing requirements and interest rates, thus calculating the resulting interest.

The implementation involved computerising the model in Fortran on the Treasury mainframe and it was implemented successfully. It proved to be a much more accurate way of forecasting debt interest and was incorporated into the overall macroeconomic model.

Examples of other early projects in the Treasury include

- Implementing the Department of Transport's forecasting model, which covered just England, for the Roads Division of the Welsh Office in Cardiff.
- Advising the chief accountant at the Lord Chancellor's Office, who was plotting applications and expenditure on Legal Aid, and couldn't see why there was a gap. Ron Ladley and Charles Dobson examined many files and found several ways applicants could drop out. They developed a distributed lag model¹³ for forecasting the expenditure.
- Ron also developed a distributed lag model for MAFF to forecast Farm Capital grants expenditure.
- Another of Ron's projects was to develop and run a Social Security model, which was eagerly seized upon by the economists at the Treasury to provide social security expenditure estimates for the Treasury Model Medium Term Assessment. It was run with different assumptions about pay and price changes, and unemployment levels, and provided estimates of the different Social Security expenditure consequences for their model.

Some projects were resourced by Treasury for departments. Whilst there was a Treasury interest of promoting efficiency and economy, these would soon be undertaken by a departmental OR group. These will appear in the section of this document for those departments.

As an aside, the Treasury OR Unit would make a lot of use of the Treasury's mainframe computer, a UNIVAC 1108. Each program run was identified by the unit's code, ORUNIT. However, analysts were surprised at how quick the turnaround was, and eventually discovered that rather than thinking that the code was ORUNIT, mainframe programmers

¹³ A A Holt, J C Dobson & R B Ladley (1981) Public Expenditure Forecasting and Control — The Practical Use of Distributed Lag Models, *Journal of the Operational Research Society*, 32:6, 437-443

thought they were urged to run the programs quickly, as they interpreted the code as 'O Run it'.

Department for Education and Science

In 1975, Willie Russell, John Corneille, and a consultant Bob Harris were seconded to work with small team of economists and statisticians from DES on issues related to education expenditure. Their successful modelling work led to the need for permanent OR replacements, and in 1977 Ron Ladley was recruited to lead the group, with Bill Latimer as SSO.

The main thrust of the work was supporting the Finance Branch and working with the Local Authority Associations through developing, running and refining the models for forecasting local authority recurrent expenditure and allocating capital grants - this amounted to many billions of pounds.¹⁴ Other models developed were a teacher salary drift model, which at the time was projecting a c2% additional increase to the already enormous teachers' salary bill. This was further developed to support Teachers Pay negotiations. There was also a teacher manpower model which provided wastage and retirement estimates and was the basis for setting teacher training intakes.

Another area of responsibility was on the forecasting and allocation of grants to universities, which were funded by DES but with advice on the distribution coming from an independent body, the University Grants Committee (UGC). At the time, the annual grant to universities was based on the average cost per student by subject. Some straightforward statistical analysis of costs per subject versus student numbers by university suggested a much more rational approach would be to split fixed and variable costs, and base grants on the marginal cost per student. Such an approach was proposed and accepted by the UGC and DES. It resulted in a significant reduction of overall expenditure on university grants.

Inland Revenue

Operational Research contributed significantly to the Computerisation of PAYE. This was a huge IT project - the largest administrative project in Europe - and no manufacturer made a computer big enough, so Inland Revenue had twelve. The small OR team was led by a PA consultant Chris French and included David Naylor.

The procurement, led by Steve Matheson, was a major project that has influenced IR and then HMRC for many years, and drove the setup of the IT in Telford. As part of the procurement, David worked on the volumetrics, the business case for more or fewer processing centres, looked at contention between tax officers sharing a VDU (!), and developed some quite sophisticated queueing models to help compare the bidders' proposed IT architectures. The system stood the test of time – although it was re-vamped several times it was not replaced until 2009 when the 12 databases were merged into one.

In 1974, Alan Hawley joined the department to form a small OR group, intended to serve the whole of “the Revenue”.

¹⁴ R B Ladley (1987) Financial Models for Projecting National Educational Expenditure, *Journal of the Operational Research Society*, 38:10, 949-956

The OR team expanded a little in 1978 and into the 1980s, with Andrew Holt taking over from Alan and Mick Hudson, Richard Mapleston and Chris Sanctuary joining the team. Projects included staffing levels in the Valuation Office, which involved work measurement using activity sampling and led to better resource allocation. Another project led to a formula determining the resource need for tax inspectors¹⁵, which was used for many years until technology rendered the local network approach obsolete.



Andrew Holt

Department of Trade and Industry

In the mid-1970s, Treasury OR set up an expenditure forecasting model for Regional Selective Assistance, and to identify system flows. The work was done by two SSOs, Alec Marsden and Ron Ladley. This involved an extensive data gathering exercise in all the regional offices, recording what percentage of applications dropped out, were rejected, offers made, and payments made. A lot was learned about the system, which was used to improve things, and to forecast expenditure using a distributed lag model.

The OR Group in Department of Trade and Industry¹⁶ (DTI), led from 1977 by John Corneille, was successful in the areas of manpower planning and public expenditure forecasting. On the former, the DTI then had large groups of specialist staff in organisations such as the Patent Office, HM Coastguard and the Insolvency Service and effective manpower planning was an essential element of ensuring continuity of service.

Another project concerned forecasting expenditure on a new scheme of selective financial assistance for specific industries (eg machine tools, ferrous foundry and electronic components) which were key to the economy. Schemes were introduced at different times for specific industries and ran for varying periods so forecasting the expenditure consequences was problematic. Again, with Treasury OR's Charles Dobson, John devised an approach based on Bayes Theorem, which worked successfully¹⁷.

Around 1980, OR led a multi-disciplinary team to review the information systems requirements of DTI's Regional Offices. This project reported to a steering committee of senior executives and, although not strictly OR, was a recognition that OR analysts knew how to run large projects.

Department of Environment and Transport

A Mathematical Advisory Unit was set up in 1967 at the instance of Bill Williams and reported to a Senior Economic Advisor. David Quarmbly was one of its earlier members and it consisted of Science Class staff. It split in two in 1972 - the Systems Analysis Research Unit

¹⁵ A A Holt, M G Hudson (1983) Resource allocation within government administration—the tax inspectorate, *European Journal of Operational Research* 13.3, 218-223

¹⁶ Now the Department of Business, Energy and Industrial Strategy

¹⁷ J P Corneille & J C Dobson (1983) A Model for Forecasting Public Expenditure on Schemes of Selective Financial Assistance for Industry, *Journal of the Operational Research Society*, 34:2, 119-126

(SARU) and a team in the Economics of Transport and Highways Division.¹⁸ The establishment of Operational Research in the Department of Environment and Transport is therefore a separate initiative from the drive from CSD.

Peter Roberts led SARU from 1976. This multidisciplinary team, which was mainly OR staff including Jeff Jones, used systems dynamics to produce global modelling of the world economy within resource constraints. They also modelled UK energy demand and UK house prices. In all cases OR came to unexpected, counterintuitive results, which sadly did not have the impact on the department that they should have done.

A separate small OR Unit was introduced into one of the branches of the Management Services Division, staffed mainly from MOD supported by consultants. It was led by Paul Rose was active from the early 1970s. The OR section expanded in the mid-1970s by recruitment of experienced OR people from outside the Civil Service at grade 7 level (which was then unusual). It included Phil Smith, Max Moullin, Joe Fitzsimmons, Errol Babington and Alan Greaves. With further recruitment of Scientific Officers, the OR section then constituted about half of the branch.

None of the staff had a background in CSD, so there were not the same easy relationships with other departments' groups, and there was relatively high staff turnover at senior levels. It was located in Lambeth Bridge House.

The OR section was active in support of many parts of what was a very large Government Department. Projects included work on environmental pollution, housing, road construction, motorway winter maintenance, driving test demand, and resource allocation in the Property Services Agency.

When the Department was split in 1976 into its separate parts the OR section was similarly divided to continue in the separate Management Services Divisions. In the Department of Transport, the OR group was part of a branch that at various times also had responsibility for a Forms Design Unit, the Staff Suggestions Scheme, and the Departmental Management Plan. That last responsibility gave engagement with very senior administrators throughout the Department, and brief contact with Ministers.

Export Credits Guarantee Department

The Export Credits Guarantee Department¹⁹ (ECGD) supported the provision of Fixed Rate Export Finance (FREF)²⁰. The FREF scheme enabled exporters to offer their buyers fixed-rate financing which was below market rates of interest. One of the main reasons that the OR group was formed in the late 1970s was concern from the Treasury that the forecast of public expenditure from this scheme (the difference between the FREF and market rates of interest) was not sufficiently rigorous. (This was a piece of work by Andrew Holt and Mick Hudson). The model had 2 key components – a construction of a data base using bespoke software from a commercial bureau which meant that information from loans schedules were able to be manipulated –something not possible from the Government IT systems at the time.

¹⁸ Interview of Maurice Shutler by George Mitchell, January 1994

¹⁹ Now UK Export Finance

²⁰ The Coalition Government discontinued the FREF scheme in 2011.

The nature of capital projects that they were typically delayed so the model produced the likely profile of a loan from the advances schedules in the loan agreement. The technical core of the model was the estimation of the parameters and used the golden search method²¹ – an optimisation technique. The OR group’s work meant that in the 1980s the Treasury accepted that costs would be likely to rise because of the scheme. This was something that their spending teams are always reluctant to concede.

The group started from small beginnings - 2 people (Ray Blues and Mick Goldstein) and expanded in the 1980s, led by Andre Hare and joined by Bill McKinley, Simon Manclark and Mick Hudson, tackling several projects including the regular review of premiums charged for credit insurance.

²¹ Related to the Golden ratio in geometry. Use for searching for a minimum or a maximum of a unimodal function and is the limiting case of a Fibonacci search. Kiefer, J. (1953), “Sequential minimax search for a maximum”, *Proceedings of the American Mathematical Society*, **4** (3): 502–506

Chapter 5 The emergence of GORS

As the number of civil government departments with OR increased, meetings of their leaders chaired by Ken James began to take place. Sometime in the 1970s, an annual get-together of heads of OR groups took place with an overnight stay at the Civil Service College.

Eventually this became more formalised and certainly by 1977 had taken the name Departmental OR Committee or DORC. Yes, really. In 1986, it had been changed to the Committee for OR Management, or CORM. "Government Operational Research Service" was first used in the late 1990s.

The earliest reference to hand of a circular, "Operational Research in Government Newsletter" (later re-branded "GovORn") is 1977.

Departmental OR Committee

In the 1970s and beyond, the contrast between what became GORS and the Government Statistical Service (GSS) was enormous. In the GSS, there was a unit led by a Senior Statistician (grade 5) that facilitated transfers of statisticians between departments via negotiations with donor and receiver Directors of Statistics. They also organised promotion boards and graduate recruitment. Statisticians felt that they belonged to the GSS more than the department of their current "posting". This system worked well for the GSS at the time (although it was substantially downgraded later).

The ambition of DORC did not extend much beyond a collaborative approach for graduate recruitment from universities, which was successful. University graduates interested in a possible career in government OR found it attractive to hear that a career path beyond their first employing department was on offer.

How far did departmental OR groups collaborate on transfers of OR staff between departments? This was limited to an agreement that vacancies would be circulated between OR units in other departments only if they could not be filled internally. DORC achieved an administrative triumph, long before the era of emails, in maintaining a mailing list of OR staff in each department to whom vacancy notices could be circulated.

For the top posts, however, the cross departmental trawl did work regularly and effectively. Andrew Holt, from Inland Revenue, became Richard Gibbs' successor at DHSS in 1986 through this mechanism.

In GORS' early history, many OR groups were very small, perhaps just a single Grade 7 and a handful of others. However, when GORS started getting these teams independently managed, there was sometimes an evident and understandable reluctance by either new recruits or existing staff to fill vacancies in the small teams, because they perceived that once they had gone there, there was no practical career progression thereafter. In response to this problem, an agreement was made among OR groups called the linking agreement, and although it took a while before all groups signed up to it, eventually they all did. It said that if any post at PSO (Grade 7) or higher was to be filled, it would first be trawled among all the civil OR groups. Only if that failed would other routes be considered.

In this one respect, it was a step towards treating OR staff at PSO level and above as a pooled resource. It was of clear benefit to staff in small groups who might otherwise have no promotion outlet, but arguably at some expense to the large groups, which did not need

it. On balance, it was of benefit to the Government OR community, by helping the small groups to survive and even grow.

The linking agreement lasted several years, but in time it broke down. However, with over 700 OR analysts now in GORS, it is less of an issue.

To return to the annual sleep overs at the Civil Service College at Sunningdale in the 1970s, heads of OR pitched up at Friday lunchtime, did some work in the afternoon and then had a most enjoyable and boozy evening together before returning to their long-suffering families on Saturday morning telling them what important work they had done.

One issue that was much discussed was the inferior promotion prospects for OR staff as compared with Economists, Statisticians and Fast Stream Administrators. Because OR staff were classified as scientists they were established on the Science Group pay grades (SO, SSO, PSO, SPSO DCSO) and needed to be promoted twice as frequently as their GES and GSS peers to achieve parity. Several attempts were made to try to get OR onto the GES/GSS type of pay scales by Peter Turner at CSD and others, but none succeeded.

DORC also discussed more professional OR matters, comparing experiences in different departments and attempting to learn lessons about success factors that each could try to apply in their own departments. Some of that may have been done more informally over the post prandial beers, but whichever way, the outcome was positive. Each head of OR was able to return to their own department on Monday morning clear headed and with a better idea of how to succeed. DORC clearly established and sustained an encouraging *esprit de corps* about OR in government and mutual trust between Heads of OR as individuals.

Education

DORC/CORM formed two subcommittees. One was for education and was chaired initially by Richard Eason, the director at the Civil Service College responsible for courses on statistics, economics and OR. Mick Hudson was secretary. The other members of the subcommittee represented departments including MoD and were usually Grade 7 or SSOs. To widen the market for training, CORM invited Civil Aviation Authority and the Metropolitan Police, which Sue Merchant represented.

The college employed two OR lecturers, one was Peter Armitage, but there were more in the other analytical professions. Richard inevitably used the delegates as a user group, but the subcommittee also looked to the OR Society and universities for courses. Information was passed onto departments about these.

One significant development was setting up a “PSO Conference” for grade 7s. Departments were expected to take their turn to nominate organisers. It was normally held annually. It was principally an opportunity for knowledge sharing, but there was also the objective of developing contacts and friendships. This usually comprised guest speakers, delegate speakers and perhaps something like a business game or even a social activity.

A “Junior Levels Conference”, usually organised by *Senior Scientific Officers* was founded later, but it was not until 2000 that the conferences were merged into an all-grade conference. (As mentioned in Chapter 1, junior staff also organised their own meetings and get-togethers, usually after work in a pub.)

Both these conferences were usually held residentially at the Civil Service College, Sunningdale.

Recruitment

The other subcommittee was for recruitment. This covered the civil departments only, as MoD was big enough to do its own thing. Since all the groups were small enough only to recruit in ones and twos, it made a lot of sense to pull together and run a joint competition once, perhaps twice, a year. In the 1970s, the pay scales were the same across departments, which made some things easier. However, there was a bit of a bunfight to decide who took which candidate.

The co-operative approach is taken today, even though the government OR community is unrecognisably larger.

An induction course for new recruits was started in about 1980.

Professionalism

Is Operational Research a profession in its own right?

In the 1970s, this was a question that exercised not only the leaders in government OR, but the members of the OR Society. Ken James and Maurice Shutler were keen to promote OR as a separate discipline, partly to talk on equal terms with Statisticians and Economists. (OR staff were in the Science Group.) They wanted a recognised qualification, ideally as a requirement for promotion. OR staff were all encouraged to join the OR Society.

Others, including Alex McDonald, believed that people should be able to move freely between OR posts and, for example, pure research posts in their “home” discipline. This seemed to be the prevailing view of OR analysts at large as a majority the OR Society voted for it to become an open, non-professional body. I think most junior staff voted this way because professionalism would clearly mean a higher membership fee.

Maurice was then a leader of the founding of the Fellowship for Operational Research in 1973 to offer OR people a recognisable professional qualification. However, membership of FOR never became a requirement for admission or advancement in GORS.

It is not clear how this issue was resolved. GORS is now recognised within the Civil Service as a profession, but recruitment is very much multi-disciplinary with a workforce from all branches of science and mathematics. Departments have made their own arrangements for OR staff since the Thatcher government abolished central pay and grading.

The Fellowship was wound up in 2003 when the OR Society established accreditation, which GORS has encouraged but not made compulsory for progression. Take up within GORS seems very low; probably people regard their GORS “ticket” sufficient recognition.

The Government Operational Research Service

“The Government Operational Research Service” was first used in the late 1990s. CORM became GORS(M) – M for Main, but it was the new millennium that saw some significant changes.

Alec Waterhouse and Mick Hudson were asked to formulate for what became known as the “Central Management Unit”. The GES and GSS both had central teams that managed professional development, recruitment and placement. These were headed by a member of the profession at Grade 5, or at least a Grade 6, and were staffed with administrative support. These provided a secretariat to the main committees and subcommittees of GES and GSS and organised events and recruitment. GORS had found people to do these tasks on a grace and favour basis and it was becoming increasingly difficult in line with the growth in OR.

In the event, GORS(M) decided on something of a smaller scale and in 2003, Hiroko Plant headed the new CMU with an administrative support of two posts. Funding was by subscription, each department contributing in proportion to the size of its OR resource. Whilst GES and GSS have natural homes for their equivalents in Treasury and the Office for National Statistics, there is no obvious place for OR. Dennis Rutter then persuaded Inland Revenue to provide the base.

Shortly after CMU was set up, GORS(M) commissioned a branding exercise led by Andre Hare. The most obvious outcome was our logo and colour scheme. The brand brings together the efforts of all who practice OR in government, stands for our reputation and professionalism (if you are happy to use that term) and it distinguishes OR from other professions.



