Internal OR Consulting: Effective Practice in a Changing Environment

ROBERT FILDES
Department of Management Science
Lancaster University
Lancaster, United Kingdom LA1 4YX

JOHN RANYARD
Department of Management Science
Lancaster University

Around 1970 some 96 percent of the largest Fortune-500 companies had established OR groups. The recessions of the '70s and '80s led many to close their groups. In 1993, the UK OR Society, disturbed by further closures, funded a study to identify factors that influenced the success and survival of internal OR groups. The study team found three categories of factors: changes in the external environment, in the organization, and in the OR group's management. This research shows that to be effective, an OR group needs good consulting skills, expert project management, active marketing of its services, and responsiveness to changes in its clients' requirements and in the surrounding organizational culture.

In practice, OR analysts act as consultants to their clients, usually managers, within an organization. In the early days of OR, analysts sometimes saw themselves as above the organizational political fray, acting as autonomous scientific investigators [Blackett 1950]; more often they adopted the role of consultant. As consultants, OR analysts were automatically in competition with others, for example, organization and methods (O and M) groups, accountants, and economists. People argued about the scope of organizational OR, often focusing on the role of mathematics, particularly as universities started to develop curricula in OR. The effect was to limit the scope of projects seen as suitable for OR groups. Even when a

0092-2102/00/3005/0034/$05.00
1526–551X electronic ISSN
This paper was refereed.

PROFESSIONAL—OR/MS IMPLEMENTATION
ORGANIZATIONAL STUDIES—EFFECTIVENESS, PERFORMANCE

INTERFACES **30:**5 September–October 2000 (pp. 34–50)

manager saw a project as an OR project, groups competed to work on it. Should an organization rely on an in-house team or should it bring in external consultants?

Organizations responded differently to the potential OR offered, some establishing successful internal OR groups, others making cursory attempts that faltered, while the majority, particularly small organizations, responded ad hoc to specific problems. The success of OR in World War II and the ensuing interest in scientific management led the larger companies in the US and the UK to establish internal OR consultancies. The central planning systems still in place in the UK after the war supported OR groups, the two best known being those in the coal and steel industries [Kirby and Capey 1998]. These groups greatly influenced the professional development of OR in the UK. In particular, they ensured that OR practice headed the agenda of the UK Operational Research Society. As the leaders of some of the major groups transferred to the faculties of universities through the 1960s and early 1970s to set up OR departments, they reinforced the view that good OR practice was fundamental to the profession's success. The closing down of OR groups that began in the '70s provoked Mitchell and Tomlinson [1979] to examine the principles of OR group success. Prompted by further closures, the UK Society-sponsored Commission on the Future Practice of OR [Mitchell 1986] and recently the Success and Survival of OR (SSOR) Groups Project concluded that successful internal OR group practice is fundamental for the health of the OR profession. But such groups were under threat.

Based on the OR Society-sponsored SSOR project, which we conducted, and the Bowness Symposium [Fildes and Ranyard 1998], which we organized in 1996 to discuss developments in OR practice, we examine four topics important to the OR profession:

—The demand for OR consultancy,
—Why an internal OR group succeeds (or fails),
—The development of a successful OR consultancy and its unique capabilities, and
—The lessons the OR community can learn from the changes we have observed.

The SSOR Groups Research Project

What is an internal OR group? Neither the US nor the UK society keeps an official list, and therefore the first stage in the SSOR project was to agree on a definition. OR is carried out in many functional areas within organizations and across a wide range of organizations. Project team members decided which groups to include in the SSOR survey of OR group activity on pragmatic grounds; the defining characteristics included group members' participating in the UK Society and identifying themselves as an OR group. This excluded some specialist groups of OR analysts who had line responsibilities (for example, credit scoring) or who formed part of a wider organizational unit and did not think of themselves as separate entities, for example, in information technology (IT).

Internal OR groups in the UK numbered 99 in 1990, but 22 closed between 1990 and 1997.

Table 1 shows the organizations that outsourced their OR groups during the

Category	Operational in 1995				Groups closed	Outsourced	
	Organizations	Groups	Median size	Number of staff	1990–1995 (to '97)	Organizations (to '97)	Groups (to '97)
Industrial/commercial	43	52	7	548	13 (+4)	3 (+4)	5 (+20)
Government departments (excluding Defense)	10	14	8	161	2 (+1)	0	0
Defense	1	12	not known	450 (approx.)	0	0	0
Other public sector	6	6	4	75	0 (+2)	0	0
Total	60	84	—	1234 (approx.)	15 (+7)	3 (+4)	5 (+20)

Table 1: This is a summary of the numbers of in-house OR groups considered in the SSOR study, their sponsoring organizations, and their staffing levels, 1990–1997 (the additions updated to 1997 are shown in parentheses). This includes two industrial/commercial groups that were omitted in the 1994/5 identification of OR groups which have therefore been omitted from the study and are excluded from the staffing numbers. Organizations in the 'other public sector' category include local government, the audit commission, and the police. External consultancies are excluded.

period. The seven outsourced organizations themselves contained 25 groups (British Gas having a central OR group together with 12 regional groups).

In a preliminary telephone survey, we examined external consultancies, finding that they had grown in size and number between 1985 [Mitchell 1986] and 1995. These included general and information-technology external consulting groups that served most functions in any organization (for example, Andersens and Cap Gemini) and specialist groups that offered specific approaches (for example, mathematical programming) or concentrated on certain functions (for example, logistics). We did not examine these groups further.

In addition, we identified 15 groups that had closed between 1990 and mid-1995 and gathered detailed data from 14 of these, including interviews with their former managers and some line managers, clients, and competitors. We similarly questioned a number of matched continuing groups.

We identified 82 internal groups operating in 1995 (and later two more groups). We developed a detailed questionnaire for OR managers covering the following information:

(1) Respondents' length of service, previous jobs, and qualifications;
(2) Organizations' sizes (turnover and number of employees, with fluctuations over the previous five years) and business sectors;
(3) OR groups' names, sizes, ages, locations, and reporting lines;
(4) Group members' ages, qualifications, OR experience, and previous jobs;
(5) OR groups' charging practices and financial objectives;
(6) OR groups' proposed success factors, with scores for importance and for performance;
(7) Recruitment criteria, and training courses attended;
(8) OR groups' publicity measures; and

(9) Company culture, including decision-making style and degree of centralization.

After a pilot test, we sent the questionnaire to all known in-house groups [Fildes and Ranyard 1999]. It elicited 43 responses, split into private [29] and public sector, primarily government [14]. We omitted no major group, but only the central operational analysis group within the Ministry of Defense and one of the other 11 groups (employing around 450 OR analysts between them) responded. Of the 29 private sector groups, about half charged for their services and half did not.

The continuing groups had these key features:

—Their recruits typically had little or no work experience, and what little they had lay within OR.

—Recruits had advanced OR degrees (41 percent) or undergraduate degrees only (43 percent), with charging groups preferring the more highly qualified. Their university performance was strong.

—Almost all recruits had technical or mathematical backgrounds.

—The two largest corporate groups were those of British Airways (110 professionals) and National Westminster Bank (30).

—The mean age of the groups was 21 years and ranged from two to 46 years.

—In the 29 organizations that provided full information, the OR groups had increased slightly in size over the previous five years whereas the parent organizations as a whole had cut personnel by nine percent.

When asked to score the desirable qualities of new recruits on a scale of 1(not important) to 5 (highly important), the 43 OR managers ranked problem-solving skills, quality of first degree, and social and consultancy skills most important (Table 2).

The preferred recruit is well rounded and technically competent. The demographic evidence of actual OR staff members shows that OR managers were successful in meeting their technical requirements and had not changed their hiring practices since the earlier surveys of US and UK OR practitioners. (The MBA is more often an entry qualification in the US than it is in the UK [Bradbard et al. 1987].)

The Demand for OR Consultancy

Why do organizations set up internal OR groups? Why do some groups grow and prosper while others stagnate and fail? In some organizations groups developed naturally from existing central services, such as O and M, industrial engineering, or internal audit. In the UK and Canada, members of wartime OR teams graduated into industry and government, taking their skills with them [Kirby and Capey 1998; Lindsey 1998]. In both North America and the UK, companies recognized that OR might offer them a competitive edge, and therefore there was an element of 'me-too-ism' as companies in particular industries formed group after group. Radnor, Rubinstein, and their colleagues at Northwestern [Radnor and Neal 1973; Radnor, Rubinstein, and Bean 1968] charted the progress and activities of organizationally based OR. The importance ascribed to rational analysis helped

Even successful OR groups may be swept up in the outsourcing of the larger groups.

Criteria	Average score
Problem-solving skills	4.5
Quality of first degree	4.0
Social and consulting skills	3.9
Performance in administered numeracy and literacy tests	3.4
Subject of first degree	3.3
Computing skills	3.2
Business awareness	3.2
Masters degree in OR	3.1
Experience in OR	2.9
Other postgraduate qualification	2.6
Outside interests	2.5
References	2.2

Table 2: The recruitment criteria reported by 43 OR managers ranked problem-solving skills as most important on a scale from low importance (1) to high importance (5).

the diffusion, and OR practitioners played important roles in the emerging management technocracy.

From the earliest years, OR practitioners embraced the use of mathematical and statistical models to represent problems, but some were concerned that the profession was too committed to such abstractions at the expense of the potentially more important qualitative aspects of problems. As academic OR expanded in North America and the UK, universities drew OR recruits primarily from mathematically related subjects. The effect was to pigeon-hole OR and OR groups as primarily concerned with operational efficiency, while neglecting broad-based strategic issues [Eilon 1980].

Surveys of OR practice in the US and the UK, most recently our SSOR groups project in the UK and Abdel-Malek et al. [1999] in the US, show that the major areas of OR application are operations and logistics. The techniques most widely used are statistics and forecasting, mathematical programming, and simulation. This suggests tactical studies are most common. However, evidence of effective strategic interventions is limited in part because they are often confidential [Fildes and Ranyard 1997], although OR groups continue to make major contributions to their companies, with some of these case histories published in *Interfaces*, for example, Sabre and Federal Express [Bell 1998]. Within the public sector, reports of major strategic studies are also limited, although the case studies included by Miser [1995] and reports of strategic analysis in defense [Botha et al. 1997] show the continuing importance of OR at this high level.

Many writers have lamented the dominance of quantitative modeling to the exclusion of other approaches, believing that OR should aim to contribute to all types of organizational problems, including the strategic. In response, researchers have developed new concepts in an attempt to extend OR methodology to include problems with multiple stakeholders where the problem structure is contentious [Rosenhead 1996].

We conclude that OR has succeeded in persuading organizational clients that the use of mathematical modeling can improve many aspects of operations. However, in relatively few situations has OR made major contributions to organizational strategy.

The shift in managerial culture, which has recently focused on leadership and intuition at the expense of rationality, has left management based on rational analysis not so much discredited as ignored. The education of future managers, increasingly accredited through the MBA, now focuses on strategic and financial issues, edging out OR's quantitative and modeling concepts. The reasons for this are that students find OR difficult and apparently irrelevant as surveys have shown that OR techniques are often not used. Their confidence is bolstered by user-friendly software, which they believe they can use to develop their own model-based approaches in case of need.

Some changes have increased OR's potential. Increases in organizational complexity and global competition put pressure on organizations to improve efficiency and effectiveness. New techniques, made practical in a partnership with IT through increased computer power, joined together with large databases, have delivered major savings to many companies [Geoffrion 1992; Abdel-Malek et al. 1999]. Sometimes these savings lead to changes that support an organization's strategic competitiveness [Bell 1998]. However, the SSOR survey showed that OR managers recognized few innovations as making substantial contributions to their OR group's performance over the last 10 years. The most important innovations were

—Developments in PC hardware and software;

—Improvements in simulation capabilities; and

—Problem structuring approaches, such as soft system modeling and system dynamics.

A few organizations rated data mining, neural networks, and heuristics as important. One or two identified a sector-specific development (for example, a yield-management system) as making a major difference.

Because OR is delivered by in-house OR consultants, external consultants, and managers carrying out their own OR, it is not possible to determine how much OR is being done in an organization. However, the current SSOR survey shows major changes since 1985, with internal OR groups in engineering dropping from nine to zero, in food, drink, and tobacco from 20 to 10, and in chemicals and oils from 10 to three. Banking and finance, retailing, and government have seen small increases in their numbers. In defense, internal OR groups are seen as unassailable [Forder 1996; Lindsey 1998]; likewise Bell [1998] described the strong position of OR in American Airlines, and Tobin and Rapley [1996] showed OR's importance to British Airways' success. The factors increasing or decreasing the demand for OR services vary by sector and by organizational circumstances.

All groups must build client relations.

Even within organizations that have high potential demand for OR services there can be considerable competition over how OR services are delivered among various internal specialists and external consultants. In 1985, the UK Commission on the Future Practice of OR [Mitchell 1986] was confident that most OR would be delivered internally. By 1998, Ormerod [1998] was taking the opposite view, claiming that OR was delivered primarily by external OR consultants. Certainly, organizations in the '90s have focused on core competencies, outsourcing many specialist activities, including OR unless it could be shown to provide strategic advantage (for example, yield management in airlines and credit scoring in financial services). Thus, even successful OR groups may be swept up in the outsourcing of the larger groups in which they are located, IT, for example. The organizational issue is the balance of advantage between internal and external consultancies, which include the following:

—Internal consultants know the organization, its culture, and its technology. External consultants, however, understand business practices across a range of organizations and may have specialist skills not available in-house.

—Internal groups typically concentrate on traditional modeling problems. External groups often focus on process skills.

—Internal groups have established relations with managers and understand their problems, which should lead them to initiate projects. However, issues of status, reporting hierarchies, and perceived independence may limit the projects available to them. Although more expensive, external consultants have no such constraints and have an unfettered choice of potential clients.

—Internal consultants may be judged on implementation successes, even when implementation is outside their control [Miser 1997]. The repercussions of failure may be long-standing. A corresponding external consultant may exclude implementation from the project brief or, if held responsible, may walk away from the client.

Why Some Internal OR Groups Fail

Between 1990 and mid-1995 in the UK, 15 OR groups closed down, 13 within the industrial and commercial sectors. In addition, three organizations including British Coal outsourced their OR groups. The closed groups shared the following circumstances:

—They were located in the headquarters, usually two levels below the responsible board member, primarily in central or management services and IT.

—Their size on closure was small, from four to 10 professional members.

—The OR managers had spent most of their working lives in OR, and over half were laid off.

—Sixty-two percent of staff were redeployed elsewhere in the organization.

In the two years following the SSOR study (1995 to 1997), an additional seven groups closed. A further four organizations adopted outsourcing, including British Gas (with around 70 staff).

We identified the principal reasons for closing groups by interviewing 14 of the 15 ex-group managers, some of their line managers as well as clients [Ranyard and Fildes 1998]. Of factors affecting OR

groups' success and survival (Table 3), the deep recession in the UK that started in the late '80s was seen by all the OR managers as a major factor diminishing their chances of survival along with downsizing within the head office and marketing weaknesses.

The sector in which an organization operated influenced the likelihood of group closure. In addition, the increase in the management skills supported by PC software was regarded as important. Various organizational factors influenced closure (Table 4) as did weaknesses in the internal management of the OR group (Table 5).

We also interviewed 13 clients and linemanagers. The common theme in the criticism leveled at internal OR groups was that they lacked business awareness. We interpreted this to mean that they did not understand business needs and the organizational culture. Clients typically focused on short time scales, preferring quick, pragmatic solutions. They thought too few of the OR staff had non-OR business experience. In addition, clients thought internal groups' consultancy skills and project management skills were weak compared to those of external consultants.

One detailed case study of an OR group closure was carried out [Ranyard, Fildes, and Crymble 1997] as part of the SSOR project. The closure occurred while the parent company was downsizing and evaluating each function for staff cuts. The OR group could have survived only with active support from top management, which was not forthcoming despite the group being well thought of and more than covering its costs through internal charging. Although most clients were satisfied and offered further projects, one ma-

Category	Factor
Environmental issues	Economic and technical system
	Managerial style and culture
	Managerial skills
Organizational issues (affecting the OR group)	The organization's competitive performance, markets, and technology
	Organizational style and culture
	Key head-office policies
	Reporting structure and location of the OR group
	Competition for OR work between the group and other consultants
	The group's relationship to its clients
Management issues	Leadership in the group
	Personnel
	Project characteristics, including balance of techniques and clients
	Strategic role adopted and the marketing of OR services

Table 3: We identified the factors affecting OR consultancy in our interviews with those working in OR groups and in a full appraisal of the earlier literature relating to OR groups [Fildes and Ranyard 1997]. The factors fall into three broad categories, environmental issues that affect OR in general, organizational issues specific to the particular organization in which the OR group operates, and management issues relating to the OR group itself.

Influence	Number of mentions: Overall	Main
(1) Staff- and cost-reduction pressures	10	9
(2) Reducing headquarters' role	10	6
(3) Lack of OR champion	8	6
(4) Competition to the OR group	8	5
(5) OR skills preferred in business functions	7	6
(6) Low perception of OR capability	7	2
(7) Failure to demonstrate value for money	6	6
(8) Client-access and budget difficulties	6	3
(9) Boss not proactive	5	1
(10) Hostile organizational changes	4	2
(11) Anti-analysis feeling	3	1
(12) Audit role suspected	2	1

Table 4: Various organizational influences on group-closure decisions were reported by 14 ex-managers of OR groups closed between 1990 and 1995. The entries show the number of groups in which the influence was observed. The maximum score is therefore 14.

jor client had deserted the group, arguing that OR expertise was available within his department. This overreliance on a single client made the group particularly vulnerable, along with such factors as weak consultancy skills, limited business experience, inadequate project management, and insufficient marketing. At closure, three staff members were laid off, including the OR manager, and five were redeployed. Two years later only one remained in the organization.

Why Some Groups Succeed

Many groups have succeeded and prospered over a difficult period by responding to those organizational factors conducive to successful OR practice (Table 6). However, a gap can arise between actual performance and potential. The two important factors Table 6 highlights when the gap is largest are the organization's awareness of OR's capabilities and the

Influence	Number of mentions: Overall	Main
(1) Insufficient marketing or selling	9	6
(2) Lack of visibility throughout the organization	9	4
(3) Poor project balance—value-for-money	7	7
(4) Poor project balance—few clients	7	3
(5) Role unclear	5	0
(6) Project management weaknesses	3	0
(7) Lack of postproject reviews	3	0
(8) Poor project balance—limited range of approaches	2	0

Table 5: The influence of the management of the OR group on the closure decision as reported by 14 ex-managers of the OR groups closed between 1990 and 1995. The entries show the number of groups in which the influence was observed. The maximum score is therefore 14.

Success factors	Importance for OR in general Average	Performance gap (Potential—Actual) Average	Rank of gap
Satisfied clients	4.8	0.9	17
Awareness of company issues and concerns	4.3	1.2	15
High-quality recruits	4.2	1.1	16
Company's awareness of OR's capability	4.2	1.9	4
Good consultancy skills	4.1	1.6	7
Access to potential clients	4.1	1.3	13
Projects implemented	4.1	1.4	12
Boss aware of OR's capability	4.0	1.5	11
Leadership of OR group	4.0	1.6	8
Strong technical skills	4.0	1.3	14
Repeat business	3.9	0.8	18
Projects in most key business areas	3.7	1.5	9
Knowledgeable about key business trends	3.6	1.7	5
Social and political skills	3.6	2.0	3
Within budget, costs	3.4	1.5	10
Balanced workload (strategic, tactical, etc.)	3.3	1.7	5
Leading-edge technical knowledge	2.9	2.1	2
Opportunities for movement into company	2.5	2.4	1

Table 6: OR managers regarded these success factors as important and saw a gap between their group's potential performance and their perceptions of its actual performance. (We asked OR managers to rank various success factors as to importance (low (1) to high (5)) and to estimate the gap between their group's performance and the ideal of 5. The number of responses ranges from 39 to a maximum of 43 since not all respondents scored all factors. The figures shown are the average scores, the average gap, and the importance ranking of this gap.) Factors for which the gap is largest and which are ranked as important are areas where improvement is most necessary.

Influence	Number of mentions
High-quality staff	6
Good project management	4
Several (at least) OR champions	3
Project selection (value-for-money projects)	3
Survival protection	3
Wide range of approaches and innovative reputation	3
Managing client relationships	3

Table 7: Of the major success factors reported by OR managers of continuing OR groups, high-quality staff is the most important. The factors listed are those mentioned by three or more managers. The maximum score is therefore 6.

Strength	Number of mentions (Maximum = 13)
(1) High-quality staff	12
(2) Good value for money	5
(3) Good at client relationships	4
(4) Good technical and IT skills	4
(5) Good-quality work	3
(6) Wide-ranging approaches, innovative	2
(7) Source of management talent	2

Table 8: High-quality staff was the most important strength of internal OR groups, as expressed by 13 clients or line managers. They mentioned several attributes of staff quality, including being flexible, responsive, proactive, good team members, well motivated, and committed.

limitations in the group's consultancy skills, the latter linking to the limited social/political skills of the OR analysts.

We carried out in-depth interviews with OR managers, their line managers, and some of their clients in some of the continuing groups. For their groups, the six OR managers mentioned the high quality of their staffs and their project management skills as the most important strengths (Table 7). Only two of the managers stressed the importance of senior management's awareness of the OR group's activities.

Most clients agreed that the quality of the OR staff was most important. They also judged the value for money from the internal group as much better than that for external consultants (Table 8). Only one client mentioned that his group's capabilities were well known across the organization.

Clients had different evaluations of the project management skills of OR groups than the OR managers (Table 9). They also criticized groups for lacking business awareness and failing to be sufficiently pragmatic, saying that the OR group often preferred the intellectual challenge to the business priority.

Weakness	Number of mentions (Maximum = 13)
(1) Marketing could be improved	5
(2) Project-management skills (compared to external consultants)	3
(3) Prefer intellectual challenges, perfection oriented	2
(4) Insufficient post-project appraisal or support	2
(5) Lack of continuity of personnel	2

Table 9: Marketing and project management skills were the most important OR group weaknesses, as expressed by 13 clients and line managers. Other weaknesses mentioned included little short-term flexibility to meet unexpected demands, lack of business awareness, and being too narrowly focused.

Developing Successful OR Consultancy

Many of the factors we have described cannot be influenced directly by the OR managers and their staff. Nevertheless, to succeed, OR groups must recognize and respond operationally and strategically to environmental and organizational pressures. Clarity of purpose is important in recruitment and training of group personnel, in project management, and, strategically, establishing the role of the OR group within its parent organization.

In some of the groups closed between 1990 and 1995, the OR group could do nothing to survive. In others, managerial failures were important. The Northwestern group identified OR group leadership as a key factor [Radnor and Neal 1973] and suggested that skills specific to operating within a particular company might be critical. Selecting and controlling projects is important, as are recruitment, training, and career planning. The OR manager needs an entrepreneurial talent to recognize potential areas of work and new possibilities, the technical command to capitalize on the latest developments in OR techniques, the ability to motivate professionals, and a vision of the role of OR within the organization.

Do OR managers meet these stringent demands? We gathered mainly indirect evidence on this issue. OR managers in the UK have typically spent most of their careers in OR within one organization. In the government, they often move between government OR groups. Our interviews with OR managers revealed that they were committed to careers in OR, not to broader organizational roles. They expected their successors to be similar. Drucker [1974] argued that the failures of management science were often due to how line managers managed it. The job specification is for a technically capable and organizationally competent entrepreneur. Our survey evidence suggested that we have not learned this lesson.

High quality staff, both OR managers and their clients agreed, were important for success. But the recruitment criteria shown in Table 2 and the weaknesses noted by clients and their line managers highlight a gap; there is too much stress on technical skills and too little on general business skills. Good consulting skills are rare in a 23-year-old raw recruit, but groups might use training programs to overcome their deficiencies. A balance is needed between the business skills of an MBA and the technical skills that lie at the core of OR [Bell and Machol 1998].

> The lone individual cannot manage a balanced workload.

Project balance [Tomlinson 1998] and project management [Radnor and Neal 1973] are important aspects of group success and are controlled by the group. The evidence showed that groups served a limited number of functional areas, although most reported no formal constraints. Project sponsorship was typically at a senior management or board level (67 percent) although the projects of charging groups and public-sector groups were more often sponsored at a lower level. Charging groups were also more successful at gaining strategic projects, which undermines Eilon's [1998] fears about the negative effects of charging. Despite the

sponsorship of senior staff, few groups made strategic contributions to their organizations by "achieving a sustainable competitive advantage" [Bell 1998]. Few groups worked in problem areas without sponsorship.

We collected evidence on OR group use of informal problem-structuring methods, soft OR. Only 51 percent of the groups used these methods, even occasionally, despite respondents' recognition of soft OR as a major development of the last 10 years that has effectively extended the boundaries of OR practice.

Groups that charge for their services use formal project appraisal methods more extensively than those that don't, perhaps because clients expect value for their money and groups must justify the proposed work (Table 10).

The most visible signal an OR group can give to its potential clients is through its name. Over half the private-sector groups (16 of 29) included operational research in their titles while three used modeling and three used decision support. These titles clearly identify the approach and the range of activities that are within the group's competence. The groups' primary objectives were to aid decision making; some added explicit financial objectives for the parent organization. One group, even aimed to "delight" its customers. No group had a line-management role, although in the preliminary telephone survey, some acknowledged line responsibilities, although staffed like core OR groups. They subsequently excluded themselves from the research.

We asked respondents whether their groups were achieving their aims. In general, the OR managers were satisfied with their groups' performance, their high-quality work leading to satisfied customers. Morale was good and most groups (even some that later closed) thought the outlook for their group was positive. A common negative theme was that too much of the work was routine and at too low a level in the organization.

Earlier research suggests OR groups can change their roles over time. Geoffrion [1992] argued that developments in IT present OR with the opportunity to join with IT in embedding applications into the information-systems infrastructure. Overmeer, Corbett, and Van Wassenhove [1998] discuss how a consultancy company developed and rebalanced its services, responding to technical and market opportunities. The results of the questionnaire and the interviews also showed that

Formal project appraisal	Overall number (%)	Private sector number (%)	Public sector number (%)	Noncharging number (%)	Charging number (%)
Always	12 (28%)	9 (31%)	3 (21%)	4 (16%)	8 (44%)
Sometimes	13 (30%)	8 (28%)	5 (36%)	8 (32%)	5 (28%)
Rarely	10 (23%)	9 (31%)	1 (7%)	8 (32%)	2 (11%)
Never	8 (19%)	3 (10%)	5 (36%)	5 (20%)	3 (17%)
Total	43	29	14	25	18

Table 10: The frequency with which groups formally appraise their projects is greater for charging groups than for noncharging groups. But many groups still fail to appraise. (The figures in the charging and noncharging columns include both public- and private-sector groups.)

groups changed their roles. Based on the survey data, we developed five possible archetypes and collected survey data on the primary and secondary roles that continuing groups had adopted. The roles were

—Broad-based internal consultant, where the group attempts to deliver many if not all the services offered by a major management consulting company, eschewing their technical expertise;

—Focused analytical consultant, where the group offers a wide range of OR modeling expertise;

—DSS designer within the IT function, where the group's primary task is the design (and sometimes support) of management systems usually based on quantitative models;

—Technical niche, where the group has a primary function for one client in the organization, for example, credit appraisal, which often includes line responsibilities (in the example of credit appraisal, controlling credit and setting aside provisions); and

—Middle man, where a small group acts primarily as intermediary between outside consulting services and the internal clients, perhaps staffing key project committees.

All five roles are viable, but most groups aimed to be focused analytical consultancies (49 percent) with broad-based consultancy the second choice (35 percent). The primary role capitalizes on the unique qualities of OR compared to the competencies developed by MBAs.

Except for groups occupying a technical niche, all groups must build client relations. Groups must market their services both to promote their capabilities to stimulate demand and to publicize their successes to ensure that senior management understands the group's effectiveness. Continuing groups publicized their achievements by using written material, in particular newsletters (Table 11).

OR groups also employed other publicity methods:

—Presentations to potential clients (58 percent make two or less per year);

—Circulation of project reports (42 percent circulate fewer than three per year);

—Meetings with potential clients (30 percent conduct six or more per year); and

—Lectures on in-house courses (63 percent did none).

Charging groups are more active in marketing their services.

Publicity channels	All number (%)	Private sector number (%)	Public sector number (%)	Charging number (%)	Noncharging number (%)
OR newsletters	7 (16)	4 (14)	3 (21)	3 (17)	4 (16)
OR brochures	13 (30)	6 (21)	7 (50)	7 (39)	6 (24)
Department and company newsletters	15 (35)	10 (36)	5 (36)	6 (33)	9 (36)
Number of groups reporting	43	29	14	18	25

Table 11: OR groups use a variety of publicity channels, in particular newsletters and publicity brochures. Brochures are particularly popular in the public sector. (The figures in the charging and noncharging columns include both public- and private-sector groups.)

The Future of Internal OR Consultancy

The 1990s recession put UK internal OR groups under pressure as managers focused on short-term centralized financial control, downsized head offices, and established increasingly autonomous business units. Many groups did not survive for reasons beyond the changes in the environment and in the organization:

—Ineffective leadership and lack of business awareness;

—Personnel issues, including problems recruiting, retaining, and training staffs;

—Inadequate attention to the OR group's strategy;

—Poor management of the project portfolio, including problems with balance, project control, and staff skills; and

—Failure to market the OR group's services.

A survey of INFORMS' members [Abdel-Malek et al. 1999] reiterates some of these points, in particular the importance of marketing.

Some groups, such as American Airlines [Machol 1998], built skills that enabled them to deliver "useful and profitable services" and have been managed successfully to "finish the job by seeing it implemented." However, our analysis of current OR practice shows that some groups have been poorly managed. Many of the groups that continued have not repaired identified weaknesses. In these competitive times, when OR groups can no longer rely on active management support, the penalty for mismanagement is severe: the internal OR consultancy disappears. This research also shows that OR methods and approaches can be developed into services central to the success of the organization.

The Implications for External Consultancy

External OR consultancy has expanded at the expense of internal groups. Can external consultants deliver services essential to organizations' core activities? Overmeer, Corbett, and Van Wassenhove [1998] explain that the uniqueness of an OR product arises from the successful relationship between the consultant and the client organization. Projects, they argue, will be undertaken through a "temporary bundling and then unbundling" of different forms of expertise drawn from a network that includes both internal and external groupings. Outsourcing OR expertise to external consultants has not achieved the desired effect but rather has stripped the organization of one competitive element in its battle for survival. External and internal OR groups face the same challenges—to collaborate effectively with their clients to develop unique capabilities [Zimmerman 1998].

The Implications for the OR Community

Despite the declining numbers of in-house OR groups, OR is more widely practiced than ever before. Demand for OR graduates (mostly with master's degrees) is high. Companies sponsor internships and scholarships to attract quality recruits. The trend is for the OR staff to be located closer to the point of use. However, such dispersed OR is not viable long term: the lone individual cannot manage a balanced workload, has limited expertise, cannot draw on others for support, and, on departure, leaves no replacement with the same skills. The OR community must develop a support network that provides lone OR analysts with some of the benefits

of working within groups: a range of skills, peer review, learning, and organizational visibility. Perhaps increased use of intranets and the Internet can bind like-minded individuals together with the professional societies. As yet such innovations as Practice OnLine, developed by INFORMS, appear to have had little impact.

In the UK, the leaders of internal OR groups have ensured that OR practice remains at the top of the OR Society's agenda. Even so, the OR community is increasingly polarized between the academics in the professional societies (INFORMS, EURO, and so forth) and the majority of practitioners, either consultants or isolated OR practitioners, who do not regard the societies as helping them in their fight for survival.

References

Abdel-Malek, L.; Johnson, F.; Wolf, C.; and Spencer T., III 1999, "Practice: Survey results and reflections of practising INFORMS members," *Journal of the Operational Research Society*, Vol. 50, No. 10, pp. 914–1003.

Bell, P. 1998, "Strategic operational research," *Journal of the Operational Research Society*, Vol. 49, No. 4, pp. 381–391.

Bell, P. and Machol, R. E. 1998, "Final discussion," in "The foundations, developments and current practice of OR—the Bowness Symposium," eds. R. Fildes and J. C. Ranyard, *Journal of the Operational Research Society*, Vol. 49, No. 4, pp. 434–443.

Blackett, P. M. S. 1950, "Operational research," *Operational Research Quarterly*, Vol. 1, No. 1, pp. 3–6.

Botha, S.; Gryffenberg, I.; Hofmeyr, F. R.; Lausberg, J. L.; Nicolay, R. P.; Smit, W. J.; Uys, S.; Van der Merve, W.; and Wessels, G. J. 1997, "Guns or butter: Decision support for determining the size and shape of the South African National Defence Force," *Interfaces*, Vol. 27, No. 1 (January-February), pp. 7–28.

Bradbard, D. A.; Ford, F. N.; Cox, J. F.; and Ledbetter, W. N. 1987, "The management science/operations research industrial-academic interface," *Interfaces*, Vol. 17, No. 2 (March–April), pp. 39–48.

Drucker, P. J. 1974, *Management: Tasks, Responsibilities and Priorities*, Heinemann, London.

Eilon, S. 1980, "The role of management science," *Journal of the Operational Research Society*, Vol. 31, No. 1, pp. 17–28.

Eilon, S. 1998, "To charge or not to charge," *Journal of the Operational Research Society*, Vol. 49, No. 4, pp. 396–402.

Fildes, R. and Ranyard, J. C. 1997, "Success and survival of operational research groups—A review," *Journal of the Operational Research Society*, Vol. 48, No. 4, pp. 336–360.

Fildes, R. and Ranyard, J. C., eds. 1998, "The foundation, development and current practice of OR (Papers presented at a symposium held in Bowness, Cumbria, UK, 20–22 May 1996)," *Journal of the Operational Research Society*, Vol. 49, No. 4, pp. 303–443.

Fildes, R. and Ranyard, J. C. 1999, "The management of OR groups—Results of a survey," *Journal of the Operational Research Society*, Vol. 50, No. 6, pp. 563–580.

Forder, R. 1996, "OR in Defence," paper presented to the Bowness Symposium, Cumbria, UK.

Geoffrion, A. M. 1992, "Forces, trends and opportunities in MS/OR," *Operations Research*, Vol. 40, No. 3, pp. 423–445.

Kirby, M. W. and Capey, R. 1998, "The origins and diffusion of operational research in the UK," *Journal of the Operational Research Society*, Vol. 49, No. 4, pp. 327–335.

Lindsey, G. 1998, "Four good decades of OR in the Canadian Department of National Defence," *Journal of the Operational Research Society*, Vol. 49, No. 4, pp. 327–335.

Machol, R. E. 1998, "How OR can survive and prosper," *Journal of the Operational Research Society*, Vol. 49, No. 4, pp. 392–395.

Miser, H. 1995, *Handbook of Systems Analysis: Volume Three—Cases*, John Wiley and Sons, New York.

Miser, H. 1997, "Cautionary tales," *ORS Newsletter*, No. 321, pp. 16–18.

Mitchell, G. H., ed. 1986, "Report of the Commission on the Future Practice of Operational Research," *Journal of the Operational Research Society*, Vol. 37, No. 9, pp. 833–886.

Mitchell, G. H. and Tomlinson, R. 1979, "Six

principles for effective OR—Their basis in practice," in *OR '78*, ed. K. B. Haley, North-Holland, Amsterdam, pp. 32–52.
Ormerod, R. 1998, "Beyond internal OR groups," *Journal of the Operational Research Society*, Vol. 49, No. 4, pp. 426–429.
Overmeer, W. J. A. M.; Corbett, C. J.; and Van Wassenhove, L. N. 1998, "Co-operation between strands of practice: Challenges and opportunities for the renewal of OR," *Journal of the Operational Research Society*, Vol. 49, No. 4, pp. 369–380.
Radnor, M. and Neal, R. D. 1973, "The progress of management science activities in large US corporations," *Operations Research*, Vol. 21, No. 2, pp. 427–450.
Radnor, M.; Rubenstein, A. H.; and Bean, A. S. 1968, "Integration and utilization of management science activities in organizations," *Operational Research Quarterly*, Vol. 19, No. 2, pp. 117–141.
Ranyard, J. C. and Fildes, R. 1998, "Winners and losers," *Journal of the Operational Research Society*, Vol. 49, No. 4, pp. 355–368.
Ranyard, J. C.; Fildes, R.; and Crymble, W. R. 1997, "Death of an OR group," *Journal of the Operational Research Society*, Vol. 48, No. 4, pp. 361–372.
Rosenhead, J. 1996, "What's the problem? An introduction to problem structuring methods," *Interfaces*, Vol. 26, No. 6 (November–December), pp. 117–131.
Tobin, N. and Rapley, K. 1996, "OR and IT—Gaining competitive advantage from OR British Airways," paper presented to the Bowness Symposium, Cumbria, UK.
Tomlinson, R. 1998, "The six principles for effective OR—Their relevance in the 90s," *Journal of the Operational Research Society*, Vol. 49, No. 4, pp. 403–407.
Zimmerman, H.-J. 1998, "Some observations on practising successful operations research," *Journal of the Operational Research Society*, Vol. 49, No. 4, pp. 413–419.