Editorial

The next 50 years of OR

Over the last few years we have celebrated many 50th anniversaries in OR. Interest has been fuelled by the turn in the millennium. Examples include: 50 years since the founding of the OR Society and its US equivalent;^{1–3} 50 years since the launch of the journal of the society; 50 years since many dignitaries commenced a career in OR (and even noting that 50 years had passed since the simplex algorithm was devised gave rise to a ‘birthday party’ at a Symposium).

Obviously, we can learn much from history, but we are also interested in moving forward. It is not always easy to extrapolate from the past into the future and already nearly 25 years have elapsed since Russell Ackoff and others worried about the death of OR. OR has changed much in the years since 1950 and many industrial OR Groups in Britain have declined when the sectors in which they operated declined, but OR is active in new sectors such as telecommunications and air travel. In 1950 it would have been hard to predict that these industries would be so dominant by 2000. However, when we read science fiction books we have always observed the dominance of these sectors, however, outlandish the technology might seem. In addition, many of the tools of OR have become commonplace and have moved out of OR into a wider arena of decision making, for example, computers (once the preserve of many OR specialists), statistical software such as SPSS, spreadsheets, and so on, but newer tools such as DEA and risk management software have been developed to replace them, in some sense, but will likely move out into the wider community in due course to be replaced by others, and so on. The concept of *OR Inside* continues.

It seems clear to the editors that however changed the future is there will always be scope for OR—What are the problems? What is the issue? What do you want out of this system? How can you solve the problems created by the impact of a new technology?—all these problem paradigms will continue to arise and create a need for OR expertise.

In this editorial we present views on what might happen to the content of the *Journal of the Operational Research Society* in the period to 2050.

In his recent history of operational research in Britain, Kirby⁴ concludes (p 404) ‘The Operational Research Society is in a thriving state ... and its journal is held in high esteem’. In a recent editorial⁵ we cite a paper⁶ giving further

confirmation of esteem. However, much has changed in the content and source of papers published in this journal in the period 1950–2000.

In the early days of published OR, especially the 1950s, many British practitioners were moved by a missionary zeal to tell others of the virtues of OR and thought it important to explain to others why OR was important and what led to this importance, and what OR had done for the organizations for which they worked. They hoped to lead by example and show others sufficient detail of OR applications so that they could tackle similar problems arising in their own organization. Thus in the period 1960–1989 it was commonplace to see papers published in the name of all the large British OR groups—for example National Coal Board (later British Coal), British Steel, Courtaulds, BP. Many of these papers started life as internal reports. Later they surfaced in the public domain as conference presentations and finally they appeared as journal papers. The authors were actively encouraged by heads of OR to publicise and publish. The heads themselves frequently contributed review papers describing the work carried out by their teams. Alas, this seemed to die in the 1990s when OR went through a period of retrenchment, emphasized by the migration of OR groups from the former nationalized industries into consultancy configurations. Indeed in the twelve 2004 issues of the journal although there are a number of papers whose authors are practitioner members of in-house OR groups, these are dominated by authors of a special issue on Defence OR.⁷ There are only two other papers featuring a UK-based author who is not in a university department.

Not only has the missionary zeal gone, but the strive for ‘free’ self-publicity (with a journal paper) seems also to have vanished for many practitioners. (See Williams⁸ for a recent plea for practitioner papers.)

In some senses the practitioner-led espousing of OR was not an exclusive mode. In the USA things were different. OR was always more university dominated there with few in-house company-based groups and more joint consultancy teams of academic and industrial client. In the UK there had always been traditionally less of a university push when so many in-house OR groups existed and were so dominant. Indeed, some company-based OR groups operated in a rarefied atmosphere in the 1960s that many of the emerging 1960s universities could only dream of as a way to run a group of focused academics.

One further aspect may have influenced the publishing of practitioner-based OR. In the early days of OR managers

'understood' the answers it produced, and this was one of the aims of the OR approach. Some technical developments have perhaps changed all this—managers could no longer have solutions 'proved' to them—so the need for writing up cases to be shown by one practitioner to another may have declined as studies become harder to visualize transferring to new contexts. (However, this view may be too simplistic because although some managers seem happy to use IT tools without knowing exactly how they work and are more prepared to accept expert advice, others are not and they have embraced visually interactive tools and user-friendly problem-structuring tools which offer transparency in modelling.)

The latest observations remind us of how so often OR people have themselves become expert in a new aspect of technology as a side issue to their work and have then fulfilled a role by simplifying it and making it user-friendly for managers. If this role continues for further decades then we can continue to expect papers describing this role.

Where will the journal papers of the future come from (and will they be papers)? As editors we would like to see written versions of practitioners' experience but this may be a pious hope. However, as we believe that OR has a strong future we see no reason why people will not want to continue writing about OR and its future development. We may see an increase in writings from academics but the increase may well be in the form of applied work as much as in technical developments. One of the areas of OR that is active and shows signs of expansion is Health OR. (A recent issue confirms this⁹.) The general pattern of health OR is a cooperative team of OR people working with medical staff and/or health administrators. In some senses this is very much traditional OR in the style of the World War II multi-disciplinary team. The writing up of the results generally comes from the OR side and most usually from university staff who form part of the team. This is where we as editors of this journal expect papers of the future to come from. They may not be in paper form but they will be in a form that allows them to be assessed by referees to check for their rigour and the format will be such as to allow easy dissemination. Thus through some recent trends we see evidence of good joint approaches to OR that will serve us well for the future of the journal.

These last points form a suitable lead into the remarks by Professor Mike Pidd, who as a recent President of the Operational Research Society is well placed to comment on an important aspect of the future of OR. His remarks follow.

T Williams and J Wilson

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The next 50 years of OR: it takes two to tango

Some personal history

I first stumbled across OR as a final year engineering undergraduate. It was listed as one of the final year options open to us, though its availability was in doubt due to a shortage of suitable teachers. I vaguely recall organizing a petition to ensure that the course was taught. It was, but why was I so keen? I think it is because the little I had read about OR, and this was very little indeed, suggested to me that mathematical ability and an interest in practicalities were the basis for success in OR. I worried a little when I tried to read the Journal in the library, but it was just one more thing that I did not understand. On reflection, I saw OR as a refined engineering discipline in which the intellect was brought to bear on issues of practical concern.

The reality of an introductory OR course for engineers was somewhat different: we learned the simplex algorithm, grappled with simple dynamic programming, imagined ourselves in queues and tried some manual simulations. However, it still looked interesting enough for me to continue on an MSc course in Birmingham—chosen because the woman who is now my wife was a student there.

To be honest the MSc course was a bit of a disappointment since, apart from the project, it continued the textbook emphasis on abstract mathematical and statistical models. However, while an MSc student I married and this may have affected my concentration on the course! After the MSc I started work at Cadbury Schweppes and was immediately struck by how much fun the work was, compared to textbook OR. I found myself developing models to understand consumer markets, to support strategic planning and to help organize supply chains. I had been taught none of this and so probably did not work very effectively, but I enjoyed myself and was paid for it.

Why this personal history in a paper about the future? After a few years I moved into academe, intending to stay for a few years and then return to practice. I did so because I believed that OR education could better reflect the world of practice. As Checkland and Holwell¹ point out, in some subjects the world of practice is often ahead of the academic world, and I think this is often true of OR. It is certainly true of much work in computer systems. I never did return to the world of full-time practice, but have continued to conduct practical work and to supervise students doing so—again being paid for what I enjoy. Hence, my theme is the changing interface between theory and practice.

Theory and practice

It is often assumed that academics should develop theory, which is then transferred into the world of practice. This technology transfer model is sometimes valid: for example, much of the early work on visual interactive simulation was conducted in the academic world (Hurion²) and then implemented and developed further by software companies and consultancies. The same is true of some of the developments in large-scale optimization, especially for integer programming, which allow the development of close to optimum schedules (Mason *et al.*³). However, I suspect that the proportion of OR theory that finds its way into practical work is very small—perhaps less than 5%. This is probably no different from some other applied subjects, but it does suggest that some caution is needed when tempted to claim the primacy of theory over practice.

An alternative model, rather better than technology transfer, is to regard theory and practice as symbiotic; each would be weaker without the other. Developing and maintaining this symbiosis can be difficult, however, since it requires different attitudes from both parties. Theorists must dirty their hands in real problems and not pretend that implementation is about testing their algorithms on hypothetical test problems. Practitioners must be willing to explain their real problems and be willing to develop relationships that support fundamental investigations. This is difficult, but I suspect that this is the only way to ensure that OR remains healthy in the future.

In March 2004, the Engineering and Physical Sciences Research Council (EPSRC) conducted an international review of OR, with a panel that included members from the USA, New Zealand, France and Belgium—each of which has different traditions of OR. Various speakers from the UK emphasized that British OR has an applied, practical bent, which is not true in some countries. Although I am happy to support such a claim, I am uncomfortable with a view that equates OR with pragmatic consulting. OR practice will never seem coherent if it is just the pragmatic use of rational approaches in tackling real-world problems; however, important those problems are. Without a strong common core to OR, there will be no OR in 50 years time.

The opposite extreme is equally undesirable; however, if this is a view that regards abstract academic research as the cutting edge of OR. There is a danger that the current emphasis on research performance in UK universities may lead to great distortion, with implications for the future of OR. For those who do not know about such things, UK academics currently have their research performances assessed about every 5 years (the Research Assessment Exercise (RAE)) based mainly on the papers they have written. Highly rated research leads to much more money for the employing university. So far, so good—high-quality research should be well rewarded. However, this approach brings a problem that parallels one affecting English football, with its separation between the Premier League and the rest—the development of new talent. It is now very difficult for a practitioner, as I was, to join a highly rated OR research group. Only those with enough good publications will earn enough research money and this is hard to do in applied work—especially if the newcomer is still developing a research profile.

Thus, the temptation facing all academic OR groups is to employ staff who can offer highly rated papers, but who have no experience or interest in the world of practice. Needless to say, this increases the separation between practice and theory and could stretch it to the point at which contact between the two worlds is almost non-existent. Were this to happen, there will be no OR in 50 years time.

Looking forwards

I am not arguing that all practitioners must be completely up to date with the very latest approaches to tackling the problems they face. This will never happen and has never been achieved in other areas, such as medicine. I am, though, arguing that practitioners and researchers must make every effort to develop relationships that will enable practitioners to keep in touch with research developments and that will expose academics to the rapidly changing real world. I am not arguing that academics should become *faux* consultants who never spend any time deliberating on the big issues and who avoid the difficult problems. Also, I am not arguing that the 'real world' should be the laboratory of the academic in which practitioners and their clients are treated like experimental animals. Instead I am suggesting that academics and practitioners should develop and support links that keep both parties up to date with important issues and enable them to jointly develop new knowledge and theory.

Research is important, but there can never be any guarantee that any particular idea or project will be successful. Practice is important, and the messy world of deadline and budgets will always make things difficult. The challenge, if OR is to survive and prosper for another 50 years, is to find ways to ensure that the twain do meet. There are several reasons why this is difficult: such as different outlooks, timescales, priorities, career expectations and

rewards. Nevertheless, we pride ourselves on our creativity and our practicality; so it is time our bluff was called. If the success and survival of OR for the next 50 years is important, then we need set our minds to develop ways that support a continued and healthy symbiosis between theory and practice.

M Pidd

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