

THE WINNING STREAK IN CONSTRUCTION RESEARCH

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The environment of construction management research has changed considerably over the last thirty years. So too has the way in which research is evaluated, especially that undertaken in universities. However, even though the environment has changed many of the issues being addressed are broadly similar to those in the past, but the research has to be executed in a different way. As a result the key factors underlying favourable assessments of research have changed. Consideration of the 1996 Research Assessment Exercise of universities carried out by the UK government suggests that the factors underlying success are those which are largely to be expected and hold no secret threats or insights. Success seems to accompany well- balanced research portfolios of consistently high quality. A major concern, however, is the small number of universities undertaking research predominately at an international and national level of quality.

Keywords: Evaluation, environment, research, universities.

INTRODUCTION

There have been major changes in the environment of construction management research since before the foundation of ARCOM. These have influenced both the success and failure of the research community and individuals within it. In particular the way in which academic researchers in the UK, and to some extent elsewhere, have been judged has changed. So a key issue lies in the identification of the factors which lead to a Winning Streak in our field of endeavour.

Having been involved in construction management research for nearly 30 years it is surprising, despite a major change in urgency, how little the research agenda has changed. Of course the language and industrial context of our research is different and our understanding of organisations and their environments and the interaction of these with technology has improved. Also, the questions being asked seem smarter. But, when I look at recent research proposals and research reports I notice that the assumptions and the frameworks and the eventual findings have such a familiarity about them that they serve to confirm that the development of an industry and the culture of those who research it is very incremental indeed. Yet, looking over the past three decades I am acutely aware of just how our task as researchers has changed. The problems may be similar but the context in which we have to work is quite different.

These changes in context are discussed below, although the reader is referred to Lansley, (1996), Boddington, Coe and Lansley (1996), and Lansley (1997) for a more extensive discussion.

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INTUITIVE APPROACH

Over the last thirty years research policy development for the construction industry has changed markedly. I can just about recall an approach to the organisation of research based largely on the trust of public funding agencies in the intuition of researchers. The approach had its roots in the confidence that the wartime success of science had engendered in society. There was an implicit acceptance of the Shumpertian view of the impact of discovery on economic activity. However, although the approach left important legacies, by the mid-1970s it had largely disappeared.

The approach was centred on the priorities of the individual scientist. Decision-making was conducted through collegial peer networks and was dominated by considerations of excellence, independence and reputation. Above all, this approach saw the distribution of research funding as an issue largely to be decided by scientists. Whilst appraisal and review were important, following well established scientific practices, monitoring and evaluation were largely absent. In construction there was a spread of concern for both quality of life and industrial efficiency. It was a good period for those who were building researchers in government but less so for those in universities because of the lack of representation of building in the scientific establishment.

THE SYSTEMATIC APPROACH

The late 1960s saw the emergence of a more systematic approach. This was prompted largely by increased investment in research by central government both directly and through intermediate organisations, such as the UK Research Councils. They were responsible for funding university based research programmes as well as maintaining their own laboratories. The approach placed a greater emphasis on accountability, strategic initiatives and centres of excellence, but it largely remained managed by scientists for scientists. However, the pressure to defend decisions led to the development of a large administrative infrastructure in the intermediate organisations. In turn this led to the organisation of research into programmes and institutes, stronger monitoring and appraisal, and by the mid-1980s to extensive evaluation. Indeed it provided an environment which accommodated special ventures such as Science and Engineering Research Council's Specially Promoted Programme in Construction Management.

By this time the balance of research appears to have shifted. Reviews of the work of national research institutes and universities reveal the strengthening of work relating to industrial efficiency and a weakening of work with a broader societal orientation. There was an increased concern with management, economic and legal issues and a decline in multidisciplinary work reliant on inputs from the social sciences, for example, the sociology of housing design, housing in developing countries, and basic issues in the transfer of knowledge. This change reflected the completion of the post-war regeneration of urban centres and mass housing schemes. Certainly it reflected changes in social and economic policy which in turn made it more difficult for researchers to find clients, sponsors or champions of work in these areas, despite their relevance to the quality of life. Eventually, charitable foundations such as the Joseph Rowntree Foundation and the Leverhulme Trust filled the void left by government.

THE STRATEGIC APPROACH

The 1990s have seen the emergence of a more strategic approach to research management. This has been in response to continued pressure on the public purse and the need to reduce the costs of administering research. The research base has been restructured and public sector research organisations privatised, one example being the Building Research Establishment.

Funding priorities have been based on the strategies and agreements developed between scientists, government and industry. The management of research has shifted from being dominated by administration and peer review by scientists to evaluative management based on verifiable objectives and outputs. There has also been a stronger emphasis on the concept of relevance and the contribution of research to wealth creation and to the quality of life. This strategic approach views research funding as an intervention by government with the intention of bringing about a specific result. It conceives research as being managed as a business and subject to business planning and performance measurement. In short, the strategic approach is built around three key concepts: partnership management, strategic management and evaluative management.

Policy makers have been increasingly exercised by a search for evidence that unequivocally demonstrates the value of construction research, for evaluation methods and for arguments for the continuation of public sector support. The new concerns of partnership, strategy and evaluation within a national context have replaced issues of collaboration, planning and dissemination within an international context. It has not produced a very speculative environment for research. Indeed it is one which has so many checks and balances, for example, with continual references to Foresight and to the Whole Industry Research Strategy (WIRS) developed by the Construction Industry Council that it may have led to a loss of imagination in construction research.

Accompanying the adoption of the strategic approach has been the final abandonment of the linear model of research impact that had governed research policies for many years. This model, which sees technology as the driving force behind economic growth and social benefit had been discredited many years previously by social scientists who demonstrated the enormous complexity between science, technology and society. But, until recently, it remained beloved of government. It is now appreciated that the degree of impact is likely to be conditioned more by management, economic and social factors than by science and technology push.

IMPACT ON UNIVERSITIES

It is against this changing environment of public research policy that the universities have had to accommodate major changes in the culture of research.

The role of partnership management is reflected in government backed schemes for funding of research such as LINK and the Innovative Manufacturing Initiative (IMI). These have competed with conventional responsive mode Research Council opportunities, for the limited pool of research skills in construction management.

The role of strategic management is best illustrated by the importance of Foresight exercises and, for example, the value placed on WIRS by research funding agencies such as the Engineering and Physical Sciences Research Council (EPSRC). Indeed, a major change has been the ready adoption of government and industry priorities by the Research Councils, probably as a necessary means to survival.

However, the most immediate and foremost influence has been the Research Assessment Exercise (RAE). This has increased in its importance to both government and the universities. Since 1985 there have been four such exercises. Since 1989 the outcome of each of these has determined the funding to individual universities. Presently funding is distributed according to a formula, based on the research grade achieved by each university in each subject area and the numbers of research active staff, research assistants and research students in each area. This clearly illustrates the role of evaluative management in the government's management of the university system.

Given its central role to university life and thus to much construction management research the rest of the paper is focused on the RAE. In so doing it draws heavily on my experience as a panel member for the two areas – Built Environment, which included architecture, building, surveying, construction management and related areas, and Town and Country Planning which included planning, land management, property and related economic and legal areas.

THE RAE – BACKGROUND

Very briefly, a peer group panel of 12 experts supported by an industry sub-panel and administrators spent much of the summer of 1996 reviewing 55 Built Environment and 30 Town and Country Planning submissions from 60 universities. Most of the submissions were from identifiable departments or schools but some were from combinations of parts of departments (termed units in the rest of this paper). Universities provided information on just their research active academic staff, ranging from, say, 10% of the staff working in the areas through to 100%.

Each submission consisted of information for the period 1992 to 1996 covering:

- the research active staff, for example the nature of their contracts, age, length of service, numbers of research assistants and research students supervised;
- up to four publications for each member of active staff;
- research studentships sponsored by external agencies and awards of research degrees;
- funding for research obtained from external agencies;
- commentaries on the organisation of the research, recent achievements and plans for the future.

The task of the panel was to grade each submission according to a predefined rating scale (Table 1). This ranged from judging a submission as representing research largely at international level in all sub-areas of activity through to research considered to be below national level in all sub-areas. At times this was not an easy task, but through several iterations of a process of discussion, debate and research, the panel reached a final grade for each submission.

Although the panel considered the Built Environment and Town and Country Planning submissions separately, in the analyses presented in this paper the outcomes have been combined. The reason is quite simple. The dividing line between the areas was quite vague. Some universities combined their work in both areas into one submission and statistical analyses could identify no major differences between the areas when considering the relationships between the final grades and simple activity

measures based on the information available to the panel (Lansley 1998). These are discussed later and, in much more detail, elsewhere.

THE SUBMISSIONS

Given the importance of the RAE to determining the funding of universities it may be no surprise that compared with the exercise in 1992 there was an increase of 12% in the number of submissions and 26% in the number of staff (measured in full-time equivalents - ftes). Thus, in 1996 the full-time equivalent of nearly 1200 research active academic staff from 60 universities were submitted. On average 56% of the total academic staff in the subject areas were submitted, about 14 per submission. Only 12 submissions had at least 20 ftes. Crude as they are, these statistics suggest a small community comprising relatively small groups of active researchers.

Table 1: The Rating Scale

<i>Rating</i>	<i>Description</i>
5*	Research quality that equates to attainable levels of international excellence in a majority of sub-areas of activity and attainable levels of national excellence in all others.
5	Research quality that equates to attainable levels of international excellence in some sub-areas of activity and to attainable levels of national excellence in virtually all others.
4	Research quality that equates to attainable levels of national excellence in virtually all sub-areas of activity, possibly showing some evidence of international excellence, or to international level in some and at least national level in a majority.
3a	Research quality that equates to attainable levels of national excellence in a substantial majority of the sub-areas of activity, or to international level in some and to national level in others together comprising a majority.
3b	Research quality that equates to attainable levels of national excellence in the majority of sub-areas of activity.
2	Research quality that equates to attainable levels of national excellence in up to half the sub-areas of activity.
1	Research quality that equates to attainable levels of national excellence in none, or virtually none, of the sub-areas of activity.

N.B. In RAE 92 there were no 5*, or 3a and 3b ratings. However, there was a rating of 3, which had the following definition: *Research quality that equates to attainable levels of national excellence in a majority of the sub-areas of activity, or to international level in some.*

The general level of activity of the research active academics grew over the period. Compared with 1992 although income per head from Research Councils did not grow greatly perhaps because there was no growth in funds available from this source, which from others sources grew substantially, on average by nearly a half. So too did the degree of supervision of research students. Here the general impression is one of increasing research activity, although activities were spread unevenly. This is reflected by other information. For example, over half of the research active staff did not supervise research students and over 80% did not supervise research assistants. Here again there is evidence of the concentration of research activity. Probably only a third of those returned as research active were involved in significant research activity apart from the production of publications and, possibly, consulting activities. This is

less than 20% of the total population of academics in the subject areas. Clearly in each sub-area the number of active academics was small, depending on the definition used, between 50 and 125 in construction management and related fields.

THE OUTCOME

The assessment, however, was based on information about the activities of the staff submitted, not those who were excluded. So it might be expected that as universities had carefully selected who should be returned the general standard of the research represented in a submission would be reasonably high. Working against this and because of government funding being related to numbers returned as well as quality of submission was the temptation to include staff with marginal activity. These considerations led to varied approaches by the universities to trading off quality against quantity, approaches that were not helped by the failure of the higher education funding councils to declare the funding formula to be applied to the eventual grades. In the event for funding purposes the seven points on the scale were weighted - 0, 0, 1, 1.5, 2.25, 3.375, 4.05. Had this been known before hand it is likely that several universities would have reduced the number of staff declared as research active in an attempt to secure a higher quality rating.

In the event the panel identified five submissions at grade 5* the top point of the scale, and a further six at grade 5, followed by a further 13 at grade 4. It is these three grades which represent the attainment of national or international excellence in virtually all sub-areas of activities. The 24 submissions achieving this level compares with 25 in the 1992 exercise. That there should be so little change in the total number during a period when research activity grew and when its importance became more critical is surprising and, to some extent, worrying.

However, there were improvements in the mid-range. Of the 55 departments returned in both the 1992 RAE and the 1996 RAE, 15 improved by at least a whole grade, 5 moved from 5 to 5*, 8 dropped by a whole grade (taking 3a, 3b and 3 to be equivalent) and 27 remained the same. At the bottom end of the scale the vast majority of those receiving the lowest grade were new entrants to the RAE.

The overall impression formed by consideration of the grades, of few departments operating at an international level of excellence and with substantial parts of the work of others being at sub-national level, was echoed in the distribution of the grades awarded in other relatively new subject areas. Built Environment and Town and Country Planning kept company with professional subject areas such as Business and Management Studies, Social Work, Nursing, Education, Library and Information Management, Sports Related Studies, and Communications, Cultural and Media Studies. Each has strong multidisciplinary themes and communities, institutions and departments that have yet to establish strong research missions.

EXPLAINING THE GRADES

So far I have suggested that the performance of the academic community in the RAE was relatively modest. However, this ignores many factors, not least that for many of the universities, especially the former polytechnics, this was the first major attempt at achieving recognition for research achievements through an RAE within a unified higher education system, working with rules largely determined by the research-strong older universities. Without the benefit or the legacies of the dual system of funding enjoyed by the old universities or a traditional mission for research some had started

virtually from scratch. That some should improve their positions quite markedly between 1992 and 1996 and overtake some of the older universities has not been sufficiently recognised or applauded.

Other issues could be raised, but by doing so there is a danger of appearing to rationalise, even to apologise, for the level of performance. A more constructive approach might be to identify those factors that seemed to be associated with strong performances in the RAE. Here there are dangers. Firstly, as a panel member I have to be very careful not to divulge confidential information to which I was privileged to have access. Secondly, I have to avoid defending, explaining or rationalising the detailed workings of the panel.

My approach to gaining some insight to the factors associated with success is quite simple. It is based on a hypothesis, formed before the work of the panel commenced, that higher grades would tend to be associated with higher activity levels across a range of different types of research endeavour. Quite simply, departments which are able to secure funding to support their research, which attract support for research studentships from external sources, which publish in good quality outlets, and which generate a vibrant culture around academic staff, research staff and students, are more likely to achieve favourable grades than those which do not. This is not a causal hypothesis. Rather it suggests that activity levels will be a reflection of some altogether more complex activity that requires strategic direction together with careful management and organisation. For example, by itself funding may be of little use. However, by providing leverage for the development of ideas and aspirations, say, through the employment of full time researchers, a department will more readily achieve tangible research outcomes. Thus, a favourable evaluation will involve more than just achieving high activity levels. Activities have to be linked in some meaningful way. So, any activity measure is likely to be a poor proxy for any research endeavour, but it might provide a good starting point.

In the event I selected four activity measures which reflected my initial hypothesis. Incidentally these reflected the main criteria which the panel announced it would use in its evaluation and which were issued as guidance to universities (HEFCE 1995). The development of the measures is described elsewhere but in brief they were:

1. Publications – based on the distribution of different types of publication; the number of books, chapters in books and journal articles was weighted one, conference papers a half, and other types of published output zero.
2. Income – based on income from the Research Councils over the census period, weighted one, and income from all other external sources, weighted one third.
3. Research Students – the sum of new externally funded studentships received during the period and the number of research degrees awarded.
4. Culture – based on the number of independent researchers on the census date, the number of research assistants, weighted one third, and the number of research students, weighted a twelfth.

The publication measure was expressed in terms of per number of research active staff (ftes), and those for income and research students in terms of an adjusted number of staff (to take account of the potential but hidden contribution of the staff not returned in the submissions). That for culture was expressed in its raw form. Expressing culture in this way enabled the measure to capture the relationship between the size of a submission and grade. The weightings of the constituents in each measure were

chosen on the basis of empirical argument although for three of the measures these could have been replaced by weights based on the standard deviations of each constituent. Finally, the performance measure was based on the grades but transformed to a logit scale, to aid the linearity of the resulting model (Lansley 1998).

Table 2: Characteristics of Units by Grade

Grade		<i>1</i>	<i>2</i>	<i>3b</i>	<i>3a</i>	<i>4</i>	<i>5</i>	<i>5*</i>
Number of Units		<i>17</i>	<i>18</i>	<i>11</i>	<i>15</i>	<i>13</i>	<i>6</i>	<i>5</i>
Income RC/AAS	£'000	0.22	2.42	4.33	9.57	16.96	27.37	42.70
Income Other/AAS	£'000	20.83	17.31	29.53	61.68	39.26	63.76	84.32
RAs/AAS	no	0.10	0.19	0.30	0.38	0.34	0.31	0.75
RSs/AAS	no	0.63	0.75	0.75	1.09	1.19	1.85	1.16
Studentships/AAS	no	0.35	0.50	0.62	0.82	0.87	1.76	1.18
Awards/AAS	no	0.17	0.20	0.41	0.70	0.66	1.63	0.58
Indicators								
Publications	index	2.12	2.50	2.94	3.13	3.20	3.17	3.38
Income	index	3.87	5.69	10.16	22.42	28.01	43.31	70.02
Research Students	index	0.31	0.49	0.80	1.11	1.41	3.13	1.75
Culture	index	0.74	1.94	2.09	3.03	3.29	4.92	8.50

Key: RC = Research councils, RAs = Research assistants, RSs = Research students, AAS = Active Academic Staff

An indication of the relationship between each of the measures and the grades is given in Table 2. These show that, with very few exceptions, submissions in higher grades tended to have higher than average levels of activity. Correlation analysis and regression analysis using the four measures as independent variables and the grade as the dependent variable revealed consistently high correlations between the measures and grades (Table 3) and that all four measures played a significant role in explaining the differences between the grades (Lansley 1998). Over 80% of the variation could be explained by these four measures, even before taking into account information particular to a submission. However, when this additional highly qualitative information was considered, an even greater proportion of the variation could be explained, but confidentiality prevents further discussion of this particular aspect.

Further analyses showed that a single regression equation could be used for both subject areas; the relationships between the measures and the grades for Built Environment and Town and Country Planning were not significantly different. With one exception further analyses did not suggest that any additional or alternative measures should be used, or the existence of biases relating to whether a submission was from a new or old university, or from what might be considered to be leading research university. The single exception was that the proportion of staff recently recruited could be usefully added to the regression equation. This measure could be seen to extend the notion of vitality embedded in the culture measure. No doubt with persistence more effective formulations could be found but with such a high proportion of the variation explained these would be unlikely to add to the understanding provided by the relatively straightforward model presented in this paper.

Table 3: Selected Correlations by Typical Activity

		Correlations with Logit Performance			
Unit Number		<i>All</i> 84+	<i>Excl. Small</i> 71+	<i>Blt. Env.</i> 45	<i>T&C Planning</i> 26+
Income RC/AAS	£'000	0.713**	0.715**	0.804**	0.639**
Income Other/AAS	£'000	0.425**	0.508**	0.571**	0.370**
RAs/AAS	no	0.437**	0.503**	0.538**	0.429*
RSs/AAS	no	0.411**	0.357**	0.352*	0.510**
Studentships/AAS	no	0.493**	0.519**	0.579**	0.586**
Awards/AAS	no	0.489**	0.444**	0.497**	0.438*
Indicators					
Publications	index	0.610**	0.609**	0.769**	0.618**
Income	index	0.767**	0.771**	0.864**	0.633**
Research Students	index	0.654**	0.632**	0.708**	0.596**
Culture	index	0.715**	0.688**	0.749**	0.612**
Multiple correlation	index	0.900**	0.913**	0.920**	0.916**

* P<0.05

** P<0.01

+ excludes one incomplete submission

INTERPRETATION

The statistical model has to be handled with care. Whilst attractive, it should not be interpreted in a manner which would suggest that an increase in any one of the ingredients of the measures would directly lead to the achievement of a higher grade. Firstly, although a great deal of variation is accounted for by the model, for any particular level of a contributing measure, the range of grades was quite high, typically three levels. This is because of the attainment of different quality levels, as judged by the Panel, by those with similar quantitative levels, as judged by the statistical model. Secondly, the measures are reflections of a more complex process, involving the direction, management, and development of a range of resources that contribute to research activity. Thus, we might expect the measures to be a poor approximation of these. So, it would be misleading to develop policies for a university, a department or an individual on the basis of this model. However, the model does indicate that by and large the policies which lead to quality publications, external support for research and so on are those which also lead to good research.

Some colleagues have asked whether the model confuses inputs and outputs to the research process, and have suggested that outputs are all that matters. For example, funding is an input that can be used to employ research staff, who are also an input, and in turn lead to publications, an output. I am uncomfortable with this distinction. For example, often speculative papers can stimulate sponsors to provide financial support for research which in turn may not lead to further significant publications but may achieve gains for industry through applied research. Distinguishing the inputs and outputs in this case is very difficult and, to my mind, not necessary. Ultimately, however, the model is simple and straightforward and is one which most of those involved in construction research seem to appreciate.

Earlier I described the changing environment of research and how this has influenced the universities. The model tends to reinforce the importance of the response of the more successful units to the environment characterised by the Strategic Approach.

Through highlighting the role of funding and that of the culture measure it suggests that successful units have had to engage in a style of research which is either different from or combined with the more scholarly style which is captured mainly by publications and postgraduate research. However, there is little evidence from amongst those units that did not achieve a high grade that there were units pursuing either just a highly applied or just a highly scholarly style. In essence they tended to be weaker on both dimensions. This would be consistent with the view that given the applied nature of the subject areas it is very difficult to divorce the scholarly and applied styles. They go together quite naturally. This is also borne out statistically by the high correlation between the four measures.

THE FUTURE

So far I have indicated that in the context of the RAE, assessment of work in the Built Environment, and Town and Country Planning subject areas is broad and robust and does not give primacy to any particular measure and, thus it is implied, type of activity. Rather, the measures suggest that there is a range of contributing factors that in turn might be achieved by quite different styles of research. Put another way, given the current research environment, it is difficult to conceive of a university based research activity in these subject areas which, if it were of some quality, would not naturally lead to publications in academic journals, to attracting research students and others, and to securing external funding. The subject areas provide a curious blend of opportunities for highly applied research focused on the needs of industry through to quite basic, even abstract, work in which the context of the Built Environment or Town and Country Planning is almost incidental, say, just providing data for analysis. Yet, as can be found in the contents of many journals, that work can be of equal relevance and be accessible to a range of academic and other user communities.

Of course, for many departments, the skill must be in being able to develop ideas along the continuum from highly applied to truly basic, so that there is a continual interplay between problems from industry and the development of theory and models for understanding both those problems and wider issues. However, that does not mean that there is not a place for departments with very strong missions at one or the other end of the continuum. Nevertheless, it seems likely that any group involved in applied research activity will, from time to time, want to stand back from their work and take a broader and more basic view of their work. Similarly, it is likely that a group more at home with basic research will, at times, be tempted to explore the development of their work. What makes me confident of this view is that so often whether research is relatively applied or relatively basic, is not an issue of the methodology employed but one of perspective and presentation.

Here, however, there is an important issue. This is whether there is sufficient investment in basic research (Betts and Lansley 1993, Lansley and Betts 1995). Because of the pressure on academics to secure funding and research students and to publish, research has swung towards the applied end of the continuum. Fewer academics seem to be spending a great deal of time developing their ideas, in the form of new frameworks, models and theories or undertaking preliminary speculative studies on which more substantial funded research might build. The fear is that the reservoir of new knowledge is not being underpinned by basic research. It is becoming more applied and is feeding on an increasingly empirical tradition which at best draws on ageing theories and associated constructs. The future challenge,

therefore, is in creating space to ensure that the theoretical development is taking place.

This fear is well founded. Within the RAE I noted that very little theory-building was presented. This needs to be distinguished from pseudo-theory building based on, say, statistical modelling of the type presented in this paper but more often undertaken by economists and operational research specialists. Indeed, this deficiency continues to be reflected in journal papers as much as it was five years ago.

CONCLUSION

This paper has covered a range of issues bearing on the success of universities operating in the Built Environment, and Town and Country Planning subject areas. First, there has been the changing environment of research and the associated opportunities and expectations. Secondly, there are those issues that have been identified as having some relationship to the performance of universities in the RAE.

Taking the two together it seems probable that a winning streak in construction research has been achieved by those who have been able to meet two quite different demands. Firstly, the well established traditional demands of the university world and, secondly, the demands which have emerged from what has been characterised as the new Strategic Approach. However, a concern is that relatively few universities seem able to achieve a significant level of quality in these areas and that the numbers of highly rated departments has not grown. This is doubly worrying since the period covered by the RAE was one of substantial funding opportunities for both basic and applied research.

This raises issues that I have addressed before at ARCOM conferences. Firstly, since 1987 when I first asked the question, have we increased the number of True Professionals in the construction management community? On the basis of the RAE, at best the response is - possibly. Nevertheless we can take some solace in the observation that the two 5* departments in the Built Environment subject area were both construction management departments. Secondly, since 1994, when I asked whether we were a Race Apart, in this case from industry, there is evidence that as a community we have drawn closer. This is reflected by the increase in the amount of research work funded by industry and the fact that, in some ways, industry related issues figured strongly in the qualitative judgements of the Panel and, to some extent, in the quantitative measures discussed in this paper, both of which were incorporated into the assessment of quality.

Finally, if a winning streak is achieved through both good quality academic work and a sensitivity to the changing political-social-industrial environment of research then our community needs to be aware that the environment is changing even further. Whilst the essence of the Strategic Approach may remain, the key elements will change. Fairly recently there has been a reaction to the strong focus on competitiveness issues which followed the White Paper *Realising Our Potential* towards promoting the importance of research into quality of life issues. Whilst this may not jeopardise the important focus of construction management research on industrial efficiency it will create competition for resources, funds and skilled researchers, in richer and more challenging multidisciplinary areas. Just as construction management became an exciting new area in the 1980s displacing building science, so a new area may open up. By the millennium it may supplant construction management in terms of its attractions.

It is time for such a development. By now, construction management is a mature field with well-established figures, journals and courses and with a significant presence at the juncture between academic and industrial life. Those which will enjoy a winning streak will build on that maturity to ensure an increasing level of quality in the field whilst drawing on the experience of developing what was once a new field to provide the basis for establishing this newly emerging field.

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