

STRATEGIC CHALLENGES FOR THE ORGANISATION OF BUILDING RESEARCH

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Abstract

This keynote paper reviews developments in the organisation of building research since the 1950s when CIB was established. It presents a broad framework focused on trends in publicly funded research. By drawing on experience in the UK it illustrates a number of key challenges which have to be addressed by building researchers if they are to maintain credibility with government, industry and society, and by CIB if it is to assist them in responding to this task.

Keywords: research policy, innovation, applied research, basic research, partnership.

1. Introduction

Since its foundation the development of CIB has mirrored key changes in the nature and organisation of construction research around the globe. This has been reflected in its membership, in the interests and expectations of its members, and in the activities of its Working Commissions. Over the years CIB has enabled its members to achieve their objectives and aspirations as research organisations by acting as a facilitator of research networks. Further, over the years, with varying success, CIB has evolved in response to the changing needs of its members.

This paper looks beyond CIB and more generally at the factors which in many countries are shaping building research. In particular it will consider the topical and important issue of measuring research impact. Then, it draws some general conclusions which may inform the development of both CIB and its Working Commissions as well as individual research organisations and universities.

2. Changes in research policy

The intuitive approach

Over the last thirty years research policy development for the construction industry has changed markedly. In the early days of CIB the organisation of research was based largely on the trust of public funding agencies in the intuition of researchers. The approach had its roots in the confidence which the war time success of science had engendered in society. There was an implicit acceptance of the Shumpertian view of the impact of discovery on economic activity.

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. Judged by today's standards many institutes were very autonomous. Most appeared to have strong and clear missions although these did not

necessarily fit into some overall national strategy for research.

Annual reports of national building research organisations in the 1960s and 1970s and proceedings of CIB congresses and symposia reveal a rich and varied research diet. There was a spread of concern for both quality of life and industrial efficiency. It was a good period for building research. However, although the approach left important legacies, by the mid-1970s it had largely disappeared.

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 Research Councils in the UK and the National Science Foundation in the USA. 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.

By this time the balance of building research appears to have shifted. Reviews of the work of national research institutes and universities as well as the activities of CIB reveal the strengthening of work relating to industrial efficiency and a weakening of work with a broader societal orientation. Most striking was the growth of CIB Working Commissions concerned with management, economic and legal issues and the decline of multidisciplinary work reliant on inputs from the social sciences. By the mid-1970s some issues, which at the first CIB Congress in 1959 were considered of fundamental importance to the work of the building industry, were in decline, for example, the sociology of housing design, mass housing in rapidly developing countries, and basic issues in the transfer of knowledge. At the time it was felt that this change reflected the completion of the post-war regeneration of urban centres and mass housing schemes, especially in Europe, and the decline in associated research needs. Certainly it reflected changes in social and economic policy in many countries which in turn made it more difficult for researchers to find clients, sponsors or champions of work in these areas, despite their relevance to quality of life. Eventually, in the UK, 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. In some countries the research base has been restructured and public sector research organisations privatised, one of the most recent examples being the UK's Building Research Establishment (1,2).

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 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.

The impact of this approach on CIB is most obvious at the strategic level of its operation, for example in the deliberations of the Board and in the role and format of the CIB Congresses. Directors of National Building Research Organisations (NBROs) have been increasingly exercised by a search for evidence which unequivocally demonstrates the value of construction research, for evaluation methods and for

arguments which support the continuation of public sector funding. The new concerns of partnership, strategy and evaluation within a national context have replaced issues of collaboration, planning and dissemination within an international context. The latter were much more important in the early years of CIB. In a changing research environment many NBROs have been preoccupied with developing their partnerships, especially with industry, as well as managing the effects of a decline in public funding. At such a time it has been difficult to justify a style of research networking which has its roots in the era of the Intuitive Approach. As a result, the historical domination of CIB by NBROs has declined.

Of course CIB has responded. Major changes in its organisation and appeal have resulted from important strategic reviews in 1992 and 1997 making it more able to reflect the new environment of research. Perhaps as a result of this there has been an interesting re-balancing of research activities with the emergence of Working Commissions dealing with multidisciplinary areas such as urban infrastructure, architectural management, and health and safety on construction sites (3).

3. Partnership, strategic management, evaluative management

Accompanying the adoption of the Strategic Approach has been the final abandonment of the linear model of research impact which 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. However our understanding of the process is weak. So, what constitutes the new research environment?

First, there is partnership management of scientific research involving researchers, government, industry and commerce. Drawing heavily on technological forecasting activities, such as Foresight exercises, there is a better match between what research can achieve with what government and users want it to achieve. Through this, dialogue between researchers and users commences before research is commissioned and continues through to the innovation stage. Successful partnership requires that the needs of government and industry become legitimate concerns for researchers and the strength of the research base becomes a legitimate concern for government and industry.

Secondly, there is strategic management where research and innovation funding is seen as a way of intervening in industry and government to achieve desirable aims and strategic priorities. The rationale for a research activity must be stated and justified by analysis of the role of funding in developing the scientific research base, generating scientific knowledge and supporting industry's needs. Risk management is a key mechanism for ensuring that the strategic approach empowers rather than controls researchers. It facilitates entrepreneurial and high-risk actions where the rewards of success are high. Performance measurement is used to understand the risks rather than punish failure or champion safety. However, risk has to be managed carefully.

Thirdly, there is evaluative management, grounded in four measurement methods;

- technological forecasting based around finding a consensus which matches possible futures in the research base with desirable futures for industry and government;
- benchmarking to identify best practice and to set standards for expected performance;
- appraisal of specific proposals for policies, research projects, programmes and initiatives;
- rigorous, independent analysis of activities including collecting performance data on achievement objectives and impacts of research.

Since evaluation is a continuous process at the core of research management, the Strategic Approach makes little distinction between monitoring and evaluation. Of course ex-post evaluation still has an important role since it provides assessment of programmes which reflect the achievements of the

strategies and policies which govern individual projects.

Impact

These three concepts, partnership management, strategic management and evaluative management, are woven together with a fabric of performance evaluation. Objectives, measures and indicators form a common currency that allows partnership ambitions to be specified as targets and progress towards these assessed. In turn this leads to a greater emphasis on measuring impact, a concept which is rather different for different types of research. Confusion reigns when this is not appreciated. Even when it is, measuring impact is extremely difficult as demonstrated by the energy expended by numerous Working Commissions in their discussions of the lack of application of research by the construction industry. Indeed, when reviewing the available literature it soon becomes clear that the factors which facilitate and constrain the take up of research are well understood (4). However, there is less appreciation of how to increase impact.

For Basic Research the immediate impacts are largely on science itself, best described as developing the intellectual assets and scientific knowledge base. For Strategic Research the immediate impacts are on the science base, in the sense that research is brought forward and prepared for eventual application, and on potential users through developing an awareness of the opportunity to apply research and identifying specific options to do so. For Applied Research the primary impacts are on industry and government as innovations, improvements in competitiveness and as benefits to the economy and quality of life, though there will be impacts on science.

Put simply, research impact is any change that arises as a direct or indirect result of research. It can be defined at three levels:

- innovation
- competitiveness,
- economic and quality of life benefits.

On the industrial side, research supports innovation and competitiveness leading to economic and quality of life benefits. On the policy and regulatory side, research leads to innovations in policy, standards and advice which in turn impact the economy and quality of life.

This is not a linear model. Research does not always lead to innovation and competitiveness to economic improvement. Many factors inhibit this. Moreover, innovation and competitiveness themselves create environments and opportunities for research and they influence what research takes place and the impact it is likely to have. A pragmatic approach is to recognise these complexities but adopt some of the simplicity of the linear model without embodying its incorrect assumptions. This leads to a process centred model of impact which considers each impact level to consist of inputs, processes and outcomes;

- Innovation: where the inputs are knowledge transfer and the processes governed by innovativeness
- Competitiveness: where the inputs are innovations and the processes governed by competitive capacity
- Benefits: where the inputs are competitive advantages and the processes governed by competition and regulation.

A key issue in this model is the extent to which conversion of inputs into outputs is dependent on the interaction of different processes. The model is not symmetrical. The policy and regulatory impacts do not have a competitiveness level, as while government departments have to compete for resources, they are not subject to true competitive forces.

Moving from this model to the measurement of impact is not easy. First, traditionally, researchers and those managing them at policy level have rejected performance measurement as inappropriate and

imprecise. This reaction is quite unlike that of managers in most industries. They recognise the value as well as the limitations of imprecise, biased and woolly information.

The Strategic Approach demands the adoption of evaluation methods which place a strong reliance on measures and indicators rather than informal knowledge, networks and descriptive reports. Because appropriate measures and indicators have yet to be identified, tried and then tested, this demand has caused much consternation in building research circles. At policy level there is a need for strategic indicators linked to verifiable objectives, for example, targets (such as a reduction of 30% in whole life construction cost), target dates and intervention contribution. As with any business planning process there is a need for management indicators which show the extent of progress towards milestones and objectives of programmes and projects, and where impacts are occurring. Then there is a need for innovativeness and competitiveness indicators to provide information on the health of industry. In particular these need to monitor R&D and innovation activity at a company and sector level.

The subsequent stages of this process are particularly complex. Measures, and indicators have to be constructed to take account of particular policies and plans of government. In turn this leads to a questioning of prevailing cultures of research management. Despite the emergence of the Strategic Approach those most involved with research management in building whether researchers or government policy makers, are extremely uncomfortable with its challenges. Identifying and prioritising objectives, specifying expected levels of achievement and the schedules which will lead to them, as well as implementing a system of evaluation, requires a new type of intellectual and political athleticism in research management.

4. Basic research

So far this paper has concentrated on the challenges for building researchers involved with or close to government agencies, which in turn may be closely linked with industry. Of course they may be employed in universities but mostly they are in the institutes. However, turning from Applied and Strategic Research domains to the world of Basic Research we arrive at the province of the universities.

For many years academics and those who manage them have used simple measures to judge the performance of individuals, departments and institutions, measures which may have little relationship to the eventual degree of utilisation of research. Often building academics have suffered from the traditional nature of these measures, for example, publications in refereed journals and number of doctoral students supervised. In what is essentially an applied field, many would prefer measures which reflect the ability of a researcher to facilitate industry in its quest for better performance or to aid other users in the improvement of the quality of the built environment.

In the United Kingdom there have been four Research Assessment Exercises (RAE) since 1986 in which all academic areas in all universities have been subject to close scrutiny. In the last two exercises the quality of research in each area and the numbers of research active staff in each area have determined a significant proportion of public funds given to each university. In 1997 the average across all universities across all subjects was 23%, but in a large number of old universities it was well over 40% of their funding, while in some new universities it was negligible. Further for many old universities additional research income from the Research Councils and from non-public sources has been considerable.

Building research has been assessed by a peer review panel of academics and other researchers within the Built Environment subject area which also included architecture and some forms of surveying (5). The Town and Country Planning subject area covered planning and estate management. Civil Engineering formed yet another area. Each university's Built Environment research, was judged on a scale which ranged from having research almost entirely of an international standard through to research being mostly of a sub-national standard. In the 1996 exercise just two universities were placed in the highest category (6).

Success

So what were the key determinants of success? What factors were associated with a high grading?

Although the panel which considered Built Environment research adopted a relatively qualitative methodology, subsequent analysis revealed that over 80% of the variation between the grades awarded could be explained by five quite simple measures. However, size of department was not a significant determinant of success. Relatively small departments performed as well as large ones. A major share of the remainder was easily attributed to important qualitative factors not captured by the simple quantitative measures. The measures were:

- Publication Quality for example, papers in high quality refereed journals;
- Research Income especially from sources where funding was derived from a process of competition based on critical and rigorous review;
- Research Student activity for example, ability to attract funding for doctoral scholarships and effectiveness in graduating doctoral students;
- Research Culture the number of dedicated research staff (research fellows, research officers) and research students;
- Academic Staff Recruitment reflecting levels of change, replenishment and revitalisation of core academic staff resources.

Although the selection of these measures was influenced by the information submitted for the grading exercise, and to a large part they reflect traditional measures of research performance, they provide reassurance that success was recognised in a rational and predictable manner. Further it appears that success could be achieved in various ways, through quite different emphases and distinctive approaches to research activities rather than through a broad emphasis on all activities, although in some cases such an approach will have been successful. Some very successful departments had concentrated on working with industry's leading edge, whilst others had focused on traditional academic activities, such as scholarly publications and doctoral students, although generally not to the exclusion of working with industry.

Whilst many would consider the RAE to be an unnecessary indulgence created in response to government's desire for accountability and selectivity in funding, it also reflects the impact of the Strategic Approach. First, there is government strategy to stimulate better research through evaluating performance and concentrating funding in the better performing universities. Secondly, industry has played a key role in both stimulating government policies, for example, through their involvement with technological forecasting and in interacting directly with universities. As a result, over the four year period covered by the last RAE the involvement of the typical research active academic in the built environment area with user-funded research, mainly industry but including other non-academic funding agencies, increased by over 50% whilst funding for academic work through the Research Councils remained static. In the more successful departments individual academics were typically responsible for securing research support, from all external sources, roughly equal to their own gross employment costs, mostly for the employment of research assistants. By this measure it would seem that built environment academics have embraced the Strategic Approach.

Some worries

There can be little doubt that the RAE has made academic building research more accountable for its quality. However, over the decade there has not been an increase in the number of international grade departments. As a result there must be some questions about the ability of the exercise to stimulate standards of building research.

It is unfortunate, but it would appear that quality enhancement has been undermined by the RAE itself and by the changing environment of research, particularly elements of the Strategic Approach. The importance of the RAE to the funding of universities has led to an inordinate amount of pressure on every academic to publish, to secure external funding for research and to supervise research students. As

the amount of money coming to a university is a product of both the assessed quality of its work and the number of research active staff, it is not surprising that every academic is encouraged to undertake significant research activity, even those who are unsuited to it.

Further, because of the importance to the Strategic Approach of users and of relevance, building academics have been easily attracted to applied research. They have undertaken this with some success. However, whilst undertaking research work which is sound and robust enough to pass the rigorous examination of a cynical industry, some have struggled to present a methodology which meets normal academic criteria, or a line of argument acceptable to refereed academic journals. As a result, good quality work has not been recognised.

In short, the pressure for quality as represented by the RAE may have been undermined by the easy availability of applied research opportunities which have resulted from the government's pursuit of the Strategic Approach. Rather than funded research being the exception for building academics now it is the norm. As a result, the careful development of those theories and concepts underlying a funded research programme, traditionally developed in periods when funding was not readily available, has been neglected.

There should be great concern about this issue. Frequently reviewers of papers for academic and professional journals are disappointed by the poor grasp of methodology and of recent literature of building researchers. These problems are not confined to the management areas, where an understanding of construction processes need to be joined by an understanding of social process. This is a general weakness, especially when the building researcher has to appreciate other human processes, say, in health-related areas. These weaknesses do not go unnoticed by those with whom building researchers have to interact. Not only do social scientists complain about limited methodologies, a poor understanding of theory and a lack of appreciation of the literature on the part of building researchers, so do those representing user communities. These users have quite different expectations to industry users. The pragmatic culture of problem solving which has characterised the development of building research and has enabled science to replace tradition in understanding building and building processes, is becoming severely limiting when working with a broader range of users.

5. Conclusion

This paper has explored two different current perspectives on enhancing the quality of research. The first, based on the emerging Strategic Approach to research management by government, evaluates quality in terms of its impact on competitiveness and quality of life. It provides an "ends" orientated perspective which is consistent with the needs of industry and society. However, it may not find much resonance with researchers.

The second, a more introverted and self-justifying process for a university system faced with increased demands to be more selective in distributing funds for research, is more "means" orientated. That is, through adopting fairly conventional measures of academic achievement it is more concerned with processes and purely academic outcomes than with impact.

These two approaches are not necessarily exclusive, although only universities are subjected to the RAE and, generally, evaluations undertaken under the Strategic Approach are at project and programme levels rather than at a total organisational level.

The overall influence of these approaches is that whilst, on the one hand, the Strategic Approach is encouraging more multidisciplinary research, its availability and attraction to experienced researchers may be undermining the development of the very skills needed to undertake that research. This is not necessarily the fault of the approach but rather results from its interaction with the pressures brought about by the RAE. In short, reflective review and appraisal of problems and fields, theory development and methodology are being neglected.

Given these developments, which are echoed with varying intensities around the world, what are the new challenges for CIB? As an international body devoted to developing building research and improving the standing of building researchers within their home countries, how can it help researchers relate more effectively to new types of user? Whether these users are from government and industry demanding the deliverables embodied in the Strategic Approach or from elsewhere and more concerned with Basic Research, the requirement is clear. Whilst sympathetic to its pragmatic traditions, there is a need to position the potential contribution of building research within a more intellectually transparent and rigorous set of theories and assumptions about the behaviour and needs of users. In this way, the theoretical base would be strengthened, an ability to contribute to multidiscipline work enhanced and evaluation would become easier.

The challenge for CIB is immense. To respond it will need to forge alliances with other international bodies, representing many different user interests - industrial and quality of life. We should be optimistic, however, that if the trends described are relatively permanent, then bodies representing user interests will also seek to link with those with a strong involvement with the environment. In turn this will lead to another exciting phase in the development of CIB.

But, this is only the beginning. The partnership which characterises the Strategic Approach is being broadened as more public voices come into the process that provides scientific advice to government policy makers. The challenge of developing science and technology policies which are socially sustainable applies particularly to building. Not only do we need experts to endorse what we do but the public has to sign up as well (7). So a challenge for CIB is helping its members facilitate the development of genuine partnerships between the public on one hand and government and the scientific community on the other. It is only through this that building research will be able to claim its fair share of support from scarce public resources.

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Professor Lansley delivered this keynote paper at BEAR '98 which was the W89 International Conference on Building Education and Research held in Brisbane, Australia from 8th to 10th July 1998.

It reviews developments in the organisation of building research since the 1950s when CIB was established. It presents a broad framework focused on trends in publicly funded research. By drawing on experience in the UK it illustrates a number of key challenges which have to be addressed by building researchers if they are to maintain credibility with government, industry and society, and by CIB if it is to assist them in responding to this task.

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