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Challenge and innovation: The challenge to the construction industry

Report on a conference organized by the UK Association of Researchers in Construction Management

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Introduction

A one-day conference, organized by the Association of Researchers in Construction Management (ARCOM), took place in May 1989 to provide an interchange between industry and the research community. The programme was based on the premise that: 'It is necessary to go beyond superficial and self-congratulatory discussion and challenge the very basis of the construction industry as we have come to know it.' Sir Clifford Chetwood, the incoming president of the Building Employers Confederation (BEC), recently said: 'I believe we have a very fine industry but it suffers from the fact that it is fragmented, that it doesn't have a uniform platform from which to project itself. We are going to have to sit down together and think through how we can establish that unified policy basis for the whole industry.'

The present construction industry consists of more than 170 000 firms, out of which 155 000 employ fewer than eight people. In 1986, new build, industrial, refurbishment, etc., accounted for about 55% of the total output of the industry, leaving 45% for repair and maintenance. Many clients put an emphasis nowadays on 'fast track' construction. Over the last 10 years, the average speed of construction has increased from over 157 m^2 per week to something over 169 m^2 per week. The Broadgate Project has the fastest known construction of 627 m^2 per week; faster by 50% than American building projects. However, does speed preclude the inclusion of all the human and social values we wish to contain in buildings?

The following report has been compiled from the transcript of the conference. The purpose of this report is to distil the essence of the speeches and discussions that followed. No attempt has been made to attribute statements to speakers or participants.

The intention of this report is to identify the paramount issues raised, contradictions observed and problems emerging from discussion. The contents are intended to provide the basis for future debate and research.

Procurement

A question was asked very early on about the low number of clients and developers attending the conference. Clients only, perhaps, come into the construction market on an irregular

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basis as there are not that many repeat orders. Clients are becoming more sophisticated. They have seen the benefits of new procurement methods, such as package dealing and design and build, which are rooted in the concept of integrating design and production. The development of client education came out of a recent site engineering research programme. Client influence is an area worthy of future investigation. Facilities management, a concept imported from North America, is now with us. It is concerned with the systematic optimization of our property and use of our environment.

BOOT – or build, own, operate and transfer – procurement is increasing private motorways in the UK. The Japanese and North Americans have been offering this sort of package for some time as their financial approach is so much more sophisticated than that of UK firms. These packages offer the client an attractive package and behind it the idea that the contract is bought in order to get the contractor in on a fairly low profit margin but then enable the manufacturing industry to serve the contract's needs with equipment and materials. This requires us to look at the industry in an holistic way.

A paradox currently exists in the UK industry in that there is a strong trend to integrate the whole process at the same time as moving towards a greater use of subcontractors. This leads to a higher degree of complexity at the production stage. We are also fixated on first cost *vs* current cost. Cheap buildings have led to problems later, which soak up industry output.

The argument was put that architects were 'interfered' with and not given either the time or money to resolve design changes effectively. They were not being seen to speak out against this trend.

Quality and performance

Concern was expressed about the very small amount of investment that goes into architectural research. It was said that over the last 15 years, most work in this area has been done on computer-aided architectural design (CAAD), which is to some extent systematizing the design process and buildability. The process of design innovation is very poorly understood and its effect on the production process and product reliability is also very poorly understood. Some support in this area has come from the Building Research Establishment (BRE) with their defects action sheets, but that could be construed as 'fire fighting'. The Building Industry Council (BIC) has a role to play in promoting research in this aspect of the building process. Mention was made of the importance of quality and performance in the section on research and development. Management's role on site regarding the question of innovation and buildability is worthy of research and may hold the key to progress in the development of systems and reliable databases that can be drawn upon in future work and analysis.

Environmental considerations were discussed. Noise pollution and ozone depletion were the subject of particular attention. Sick building syndrome, legionnaires disease, asbestos removal and carbon dioxide emission were also identified as serious problems.

Education and the professions

Robert Jackson, Minister for Higher Education, said recently: 'Traditional self-contained qualifying courses in the construction industry are no longer adequate.' He said to the BIC that the time had come for a more general curriculum of the built environment. The old system being an endurance test in the absorption of knowledge.

Many studies of the impact of research and development on the construction industry have

pointed to the lack of communication and knowledge as the major constraints to innovation. Human beings are the most important resource we have because they are the source of innovation. Dr Elizabeth Nelson showed that we have to be ready to face the challenge of a new society. She epitomized this as displaying the growth in trends of pleasure, complexity, networking, open citizenship, a greater self-knowledge and control of strategic opportunism; the exploration of new mental frontiers.

Although (according to annual surveys carried out by the International Research Institute) Europe, particularly Italy and France, is opening to the values of other nations, the UK is not displaying this to anything like the same extent. The need for economic efficiency reinforces the consciousness that one country cannot develop irrespective of the outside world.

Demographic, social, political and technological changes mean that the need to educate, update, develop and retain skilled personnel is becoming more and more important. There is a need to improve cooperation and collaboration between industry, higher education and professional institutions. The newly formed BIC has a central role. Strong support was felt for various statements made during the conference about the lack of architectural presence. It was said by some that proceedings should be sent to the Royal Institution of British Architects (RIBA) and that architectural representatives should be encouraged to be involved. Chartered membership of the built environment institutions is a passport to a professional role in the industry. The issues of continuing professional development, training and skills testing is worthy of research and development. It was felt that more postgraduate education was required as it leads to deeper involvement between industry and education and research establishments as well as fitting us more readily for European harmonization. In many European countries, notably France, a first degree qualifies the holder for a technician role only, e.g. a draftsperson.

In the USA, there have been two recent reports on continuing education worthy of note. First, *Goals of Engineering Education* stated that masters degrees are to become the professional qualification of the future. In the *Gunter Report*, more concerned with doctorates, it was said that in France broader policy studies and social science masters degrees and doctorates were often undertaken by engineering graduates. Young British graduates are not prepared to accept the increasingly arbitrary demarcation of professional disciplines that will not (necessarily) serve them well in an international labour market.

The role of women in the economy is changing rapidly; however, the only industry sector that has less women than construction is mining. Of those women in the industry, 90% are clerical, secretarial or non-technical. This is going to have to change in the future, which means changes in the industry's culture, recruiting, training and working practices. Women are the great untapped intellectual resource that we can no longer ignore.

Further, people's working lives may well be extended due to demographic and socio-economic changes. Jobs need to be reviewed and redesigned so that automation and prefabrication increasingly become the norm. The roles of institutions is crucial. They need to work much more closely with contractors. There needs to be a move towards interdisciplinary working. It was said by some, that if the President of the RIBA did not 'get some of his members along to this type of event' he would 'be seen to abdicating his responsibilities'.

European competition

Looking at the population densities throughout Europe, the pressures on most countries like the Netherlands, Germany and the UK, which all have densities of over 200 people per

square kilometre, means that construction in these countries is under continual renewal or change because of overcrowding.

The UK is out of step with the rest of Europe in terms of educational curriculum and professional roles and training. In what was West Germany, for example, the average age of graduation of an engineer was 29.4 years. This was partly brought about by tax concessions and social security benefits making it in students' interests to continue up to the age of 30. An informal sandwich education operates which is also beneficial. Educational institutions deal with high theory, while practical aspects are picked up in the field. The exception in Europe to this practice is France, which is dominated by intellectual thought. It has a highly regulated system in which an elite is developed. Contracts have to be honoured in terms of price and time in the construction sector. Those who are highly qualified have to give about 10 years of their working life to the state. Design details are undertaken by the contractor. However, British quantity surveyors are developing a niche in the French system; there is no real French equivalent. France is a technocracy that expresses its belief in planning and administration.

It appears that the UK has only led the way in one field in Europe – privatization. Other countries have followed, but not for political reasons. Some argued that protectionism would continue to operate keenly after 1992.

One of the reasons for the birth of the BIC is changes in working practices to be brought about by harmonization. Government threatened the institutions and this led to a meeting of minds between the institutions. In other words, change was threatening, so we had to find a way to work better together. The BIC has a 2-year programme to look at definitions, competency and how things could be done better.

In the UK, we are faced not only with the need to learn foreign languages, but also the need to understand the cultures in which those languages are spoken. We have to be concerned with change, risk management and opportunities in new markets. We have to force the changes and manage them. Status and stability is managed by bureaucracy; it is highly qualified and controlled. Stability is maintained in order to achieve order. It is in this context that our new entrepreneurial innovative management has to compete and succeed. UK professional institutions have to address the issues of Eurostandards. Professional directives have to be written. Indeed, the roles and transnational definitions of occupational functions need to be thoroughly clarified. Non-EC countries who are willing to export labour may create a new 'guest worker' environment as harmonization takes a grip and as the demand for skilled labour increases.

The culture and industrial psychology of the British construction industry has to be overhauled. There will be no place for the old-fashioned 'stick and carrot' approach to motivation with inadequate bonus systems and poor interpersonal relationships. We are moving into the serious need to value, gather, handle, and utilize to our advantage, soft data. This could be in the form of rumours, feelings, hints, and so forth. It is necessary to improve soft data systems and judgemental management training and practice.

Japanese competition

The Japanese send their managers to business schools overseas; to countries where the sponsoring companies are working or want to work in the future. Japanese managers are told to listen and learn as much as they can about the culture. At any international conference on robotics, the Japanese will be present gathering information and saying very little. There is

very little coming out of the Japanese construction industry about robotics and what does come is generality and some insights. As things stand at the moment, Europe is going to follow in this area and not lead.

Japanese contractors are increasingly in the UK to develop a base from which to enter the European market. A similar approach is being adopted by the North Americans. The best project managers are those who can cross cultural boundaries. In Europe and particularly the UK, there has to be an emphasis on understanding different cultures. These include the Japanese and other Far Eastern cultures.

It is interesting to reflect that the Japanese education system, essentially, was founded by a Scot and a German. One founded the famous Engineering School in Tokyo. These two people did not get on together but out of their conflict came a kind of strength born of European intellectualism and British pragmatism.

It seems that the greatest competition is likely to be in the field of building materials. British building industry professionals will probably work for Japanese firms more in the UK and Europe generally in the future.

Research and development

A fundamental argument put forward was that the British construction industry is a low-cost industry primarily because it provides a basic human need and the public are not a wealthy public. The question of who pays for research, who administers it and how, is the starting point.

Recent figures indicate that around 0.01% of the construction industry's annual turnover is invested in research and development. Concern was expressed about recent changes at BRE, always the foundation of research in the UK. Longe-range research is suffering at the expense of short-range work. The Research Councils are stretched and competitor countries are investing significantly more; something like 2% of turnover. Other industries are investing 20–30% of turnover. The construction industry is different in one respect, in that it carries out product development as part of the construction process, whereas other industries identify this as a separate expenditure item. It was argued that research should be increased on the systemization of product development involving the construction of a database that could provide more rational information for innovation. Approximately 50% of the nation's energy consumption goes into building and buildings. This area needs more research effort. Fire prevention and protection is another important area. The proportion of the industry's output on repair, refurbishment and rehabilitation (the 3 Rs) has increased dramatically to account for 50%. Standards and management systems, as well as the problems of noise pollution resulting from inappropriate design and construction, need researching. The concept and practice of building pathology needs developing.

The Conseil Internationale du Batiment (CIB) is a very important, powerful and useful body. Industry as well as academics should become more involved in its working commissions. These cover a wide range of subject areas, such as building economics, quality, organization and management, and maintenance management, to name but a few. Getting hold of hard data is a time-consuming and costly business that involves a long gestation period. The Japanese spend a lot of effort pooling research done by others and putting it into their research machines.

In the area of organizational behaviour and information, the R&D effort has been so low and British management so slow, that we have been forced to import ideas from overseas.

BIC has a role to play. It plans to look at value, image and codes for example. Denis Vine, as chair of BIC's Research Committee, is urgently concerned with these issues. The BIC is concerned to co-ordinate and optimize research efforts in various institutions. One argument was for a whole range of strategic studies that could be done throughout the country by universities and polytechnics getting together and developing a programme for trying to set up small institutes rather than the true British style of constantly trying to kill each other.

The idea of an industry levy to produce a national research fund was discussed. It was argued that this could be done on turnover and not size. The ceramics industry has been doing this for some years now. The whole of the industry would benefit from findings. There are problems with individual construction firms who do not want to share things with competitors. This was seen as a problem of education and not of the model of jointly funded research. Arguments were forcefully put along the lines that it was not the amount of research money but the facilities that could help the industry to keep just ahead of competitor nations and therefore be first or at least have the opportunity to be first.

Summary and recommendations

There are probably four main areas for future discussion. These would all be worthy of separate conferences to develop thinking to the stage whereby useful strategies could be developed. They are as follows:

1. *Professional roles and education.* Key points here are the integration of undergraduate education through a new broad-based built environment curriculum. The rapid development of postgraduate programmes on a part-time unitized and distance-learning basis. The incorporation of the study of different national cultures as well as languages. A new partnership between industry and education as well as the professions. The role of ARCOM and the BIC in all of this. An understanding of how British qualifications and professional institutions and occupations are to relate to other European systems.
2. *Procurement.* The role played by the client and the nature of the client should be explored. Education of clients is worthy of further debate. Procurement systems and their integration of design and construction processes need to be considered in the context of technological change, economic decision criteria and risk analysis and management. The process of innovation and professional roles in the procurement context have to be opened up.
3. *Performance and quality.* The involvement of the architectural profession is vital. The research and development of integrated management systems and the process of innovation are key. Life-cycle costing, building performance and facilities management must be addressed.
4. *European and Japanese competition.* The mode of operation of Japanese contractors and financial institutions are worthy of study. In considering European competition, it is necessary to compare and contrast different European cultures and practices.

Note: R. F. Fellows is currently the Chairperson of the Association of Researchers in Construction Management.