

FACILITATING INNOVATION: THE ROLE OF THE CENTRE FOR CONSTRUCTION INNOVATION

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ABSTRACT. This case-study outlines the activities of the Centre for Construction Innovation highlighting critical success factors associated with collaborative centres and innovation brokers in transferring knowledge between Universities and Industry. The case study also explains the national context in which the centre has developed.

The Centre's approach to the provision of knowledge and tools to create an industry environment that fosters innovation is presented and discussed. The Centre brings together industrialists and academics as multi-disciplinary participants in a range of best practice education and training, seminars, workshops and in-company events, facilitating change by learning, debate and experience.

The Centre recognises the complex relationship that exists between projects, organisations, people and contracts and this in turn determines both what is possible and what is desirable. The collaborative process that seeks to achieve desirable outcomes requires inter- and intra- organisational cultural assessment and development. Facilitating this is a key role of the Centre.

KEYWORDS: Innovation Brokers; University Industry Collaboration; Knowledge Transfer

1. INTRODUCTION

The activities of the Centre for Construction Innovation are reported in this paper, specifically highlighting the critical success factors associated with collaborative centres in transferring knowledge between Universities and Industry. The goal of CCI is to supply business support for the Construction Industry generally and to promote and foster the 'Rethinking Construction' agenda (Egan, 1998) and help implement Accelerating Change (Strategic Forum for Construction, 2002) in the region and beyond. This activity was determined by its initial core sponsors Manchester City Council, through European Regional Development Funding and the Construction Directorate of the UK Government.

CCI facilitates the creation of an integrated

learning environment by bringing together industry and academia with the provision of seminars, workshops, conferences, corporate training and education in the application of advanced processes and technologies to improve the performance of regional construction. In addition the Centre participates actively itself in funded research projects as both a direct research provider and also by providing the hub or focal point of collaboration as a third party on projects it is not itself directly involved.

The extent to which the Latham and Egan reviews of the UK construction sector have resulted in sustainable and real changes in construction performance is still subject to debate. However, the Egan review was distinctive in that it established new change implementation bodies, for example the Movement for Innovation and Local Government Task

Force. While institutional change and development is reviewed elsewhere, this paper concentrates on describing the experiences of building a consensual network for change in a region with unique and distinct characteristics, and the interactions which occur between network participants.

1.1. Background

To understand the development of the Centre for Construction Innovation it is necessary to understand the national, UK, context in which it has developed. The centre was established in response to two government sponsored reports: The Latham Report (1994) and the Egan Report entitled 'Rethinking Construction' (1998). Both of these called for radical improvements in the way that the industry worked. Additionally the Egan report set targets for improvement, measured through Key Performance Indicators (KPIs), and demonstrated these through a series of 'demonstration projects'. To enable companies to adopt and share new and best practice three national organisations were established: the Construction Best Practice Programme; the Movement for Innovation (M4I) and Rethinking Construction. These organisations have now come together under the title of Constructing Excellence which co-ordinates the national demonstration projects programmes and regional best practice clubs, see www.constructingexcellence.org.uk for a full account of its activities. It is beyond the scope of this paper to attempt to detail the contents and nature of these two reports but it is important to realise that in a regional setting the Centre for Construction Innovation was able to work in support of a national agenda that many organisations were seeking to adapt to. In so doing the centre in many ways has attempted to put itself at the centre of an informal communication network, which is increasingly recognised as key in innovation diffusion by seeking to maximise face to face contact through groups and activities that emphasise

networking opportunities (Larsen and Ballal, 2005). In the literature much focus is placed upon the definition of innovation with the most popular definition produced by Freeman (1989) 'Innovation is the actual use of non-trivial change and improvement process, product, or system that is novel to the institution developing the change'. This definition is used also by Koskela and Vrijhoef (2001) and Slaughter (1998). However, in a practical situation an organisation is not usually restrained by definitions, more often it has to be responsible to the demands of the companies that it is working with and also to its funders. In this regard the UK governments definition of innovation, through which the centre was originally funded, as 'the successful exploitation of new ideas' (DTI, 2003) is the most pertinent.

As stated by (Sexton *et al.*, 2001) there is a lack of research into innovation diffusion in construction, but to put such a centre into an international context a useful source-book on public policies for construction innovation is provided by *Innovation in Construction : An International Review of Public Policies* (Manseau and Seaden, 2001). A considerable amount of research on economic performance generally (e.g. Porter, 1990), and innovation in particular has investigated the ways in which successful firms cluster geographically. In a regional context the centre is a key element of the regional developments construction cluster policy which is based around this concept. As part of the CIB's TG47 work programme the centre participated with other international innovation brokers including those listed below:

Construction Technology Centre Atlantic (CTRA)

The CTRA is self-funding, and aimed at technology transfer to the AEC industry in Canada's maritime provinces.

Cooperative Research Centre for Construction Innovation (CRC-CI)

Has substantial funding in cash and kind from Australian government and industry with a varied programme of research with the overriding aim of stimulating greater levels of R&D

activity in the Australian construction industry.

Building Research Establishment (BRE)

Based in the UK, a large long established construction innovation broker. Originally funded largely through government grants, the BRE has been privatised, and now has to bid for research funds from government and industry.

Centre Scientifique et Technique du Bâtiment (CSTB)

The principal French construction research institute which, in contrast to the BRE, remains in the public sector.

It is possible to classify these and other organisations into three categories of brokers:

1. Independent centres with a large range of research skills (BRE; CSTB) offering a broad range of services to industry.
2. Organisations connected with research universities which offering more specialist research capabilities (CRC-CI).
3. Networked advisory services staffed by people with extensive industrial experience who work more in a consultancy mode (CTRA).

In this context CCI is a small organisation that falls somewhere between 2 and 3.

1.2. History

The Centre for Construction Innovation was officially launched on 30 October 2000 with a debate held in the Council Chamber of Manchester Town Hall. However, this was the culmination of relationships that had been building in various networks for a number of years. CCI is a not for profit ‘enterprise centre’ of the University of Salford that has developed into a partnership between Manchester City Council, and other support organisations including Manchester Chamber of Business Enterprises (local network), the Construction Best Practice Programme, Rethinking Construction (national industry improvement organisations), the North West Development Agency (government funded regional development agency), Construction Industry Council NW (regional component of the industries various professional bodies) and the Construction Industry Training Board (national training organisation funded by a levy of all construc-

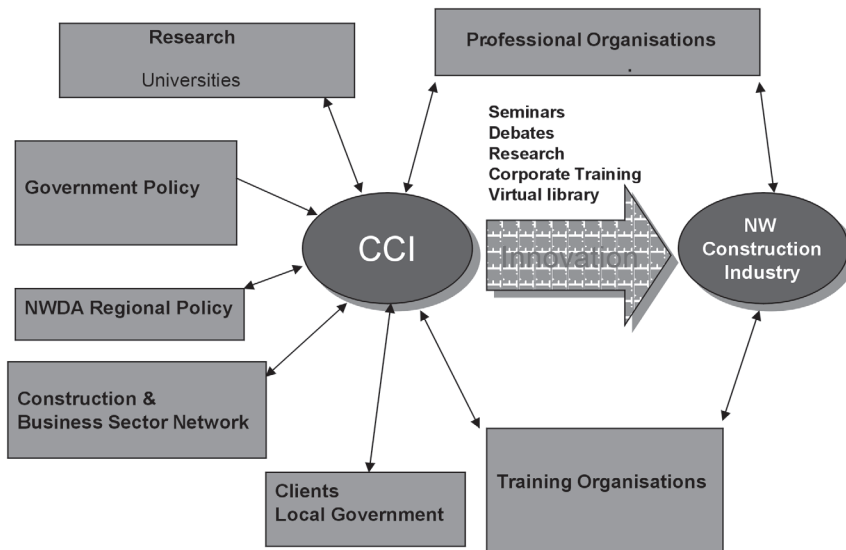


Figure 1. The CCI Network

tion companies). The Centre is hosted by the School of Construction and Property Management at the University of Salford. Collaborative links are established with other regional universities. The university base coupled with the industry networks enables the centre to work in both a market pull and a research push mode as described by Sexton and Barret (2003). This is illustrated in Figure 1.

At the time of its launch in October 2000 CCI had a grant income of £180k annually together with seed funding from the then UK Government Department of Environment, Transport and the Regions (DETR). The centre has grown substantially and in 2003 will have an estimated turnover of £1.9 million.

2. DELIVERING CHANGE AND IMPROVING PERFORMANCE

The network, which forms the basis of the CCI contact database, currently has over 1000 companies and organisations of varying sizes across the full spectrum of the construction industry, with nearly 2000 separate contacts. The CCI website www.ccinw.com is intended to give support to construction industry companies who wish to find out more on best practice and innovation.

The Centre diffuses knowledge and best

practice to the local construction industry with the twin aims of benefiting the sector and contributing to economic regeneration. The Centre promotes cultural change encouraging debate and developing mechanisms for the implementation of best practice. Much of its focus is on improving quality through integrated processes and collaboration. It endeavours to provide inspiration for business improvement; opportunities for engagement; learning and benchmarking; signposting service and hands-on access to new computer applications systems and technologies on behalf of its partners and linking institutions.

The CCI portfolio of activities has developed rapidly as shown in the Table 1, below. Seed funding from the ERDF and Construction Directorate, combined with considerable effort and goodwill amongst the network members enabled growth to take place and the geographical base of CCI to be increased to cover the whole North West region.

The purpose of CCI is to deliver change and improve the performance of the construction industry in the North West. CCI's aim is to provide practical help to promote and implement the principles of Rethinking Construction, and provide a state of the art knowledge base of best practice and innovation through its website, seminars, workshops, conferences, and in-company support.'

Table 1. CCI activities

CCI activities	2000	2001	2002	2003
Seminars/ Conferences - in house	✓	✓	✓	✓
Benchmark audits		✓	✓	✓
KPI audits		✓	✓	✓
Bespoke Training		✓	✓	✓
Industry Reports		✓	✓	✓
External Workshops		✓	✓	✓
Team Integration – Partnering advice			✓	✓
Procurement support			✓	✓
Supply Chain Development			✓	✓
Development of Framework Agreements				✓
Digital / Hi Tech show casing				✓
Corporate Change				✓

2.1. Rethinking Construction and the Construction Best Practice Programme

CCI provides the home and administrative support for the regional Rethinking Construction Cluster Group and for the North West Construction Forum (a Construction Best Practice Club).

The Rethinking Construction Cluster Group meet monthly to showcase regional demonstration projects, to address issues and themes aligned with the ethos of Rethinking Construction and to discuss and debate these issues. There is a huge resource of information and learning contained in these demonstration projects and in particular in the knowledge and experience of the cluster group members.

CCI works with the Construction Best Practice Programme (CBPP, 2002) in a number of ways. For example, through the North West Construction Forum, CCI has run a well attended series of 'Last Thursday Twilight Seminars' since its launch in October 2000. These seminars are on the themes of best practice, innovation and business improvement for the construction industry. These events provide a rich resource for the HE sector to feed into and draw from. Any students are welcome to attend these seminars which provide an excellent dissemination opportunity for University research, providing a receptive and informed industrial audience.

There is an overlap of themes and audience between the Construction Best Practice Programme and Rethinking Construction. CCI works in the region to co-ordinate events and activity and also to help shape the national agenda from a regional perspective. An example of this is the way that CCI provided coordinated and detailed feedback during the consultation period for the Accelerating Change report (Strategic Construction Forum, 2002). As part of this consultation process CCI hosted a NW Best Practice Club meeting in Manchester which provided feedback from an electronic voting exercise based around the draft Accelerating Change report's questionnaire.

In addition to CBPP and Rethinking Construction, CCI now works with other national organisations to promote and host their seminars and workshops in the NW. The promotional and organisational work of CCI for these events on the ground in the NW has been instrumental in their success. The Institute of Civil Engineers is co-located in the home of CCI and the building is shared with the Royal Institute of British Architect's regional bookshop.

2.2. CCI as a regional player

The increasing engagement of CCI with the North West Development Agency (NWDA) is key to its development. The NWDA has reassessed the role of construction in the region and is now applying the principles of Rethinking Construction to its own construction work. Collaboration with CCI has raised the profile of construction in the NWDA and resulted in construction being added to the twelve other key "cluster" industries (Porter, 1990) in the North-West selected for industry support and development. This has the potential to make significant changes for the better for the industry in the region.

CCI initially worked with the NWDA to draft their response to Better Public Buildings (DTI, 2000). Discussions during and after this time resulted in the NWDA tendering for a training programme to realign their culture and working practices with Rethinking Construction and Better Public Buildings. CCI successfully won this tender and have now commenced the delivery of this programme. CCI have also worked with the NWDA in other capacities. This has included working with the Innovation Team of the NWDA to assess the use of robotics in construction as a means of improving health & safety.

An increasing number of, mainly public sector, clients are turning to CCI to help them measure performance, compare to others and then adopt change and implement business improvement tools in line with the local au-

thorities Rethinking Construction Implementation Toolkit (Rethinking Construction, 2002). Examples of this include the development of framework agreements on behalf of local government clients such as Manchester City Council and Blackpool Borough Council.

2.3. Business improvement

Assisting in the development of SMEs is a key deliverable for CCI. The Centre has worked with the Construction Industry Training Board (CITB) and Business Links in the region to deliver business improvement mechanisms to the industry. CITB led a major project funded by the NWDA entitled "Co-operation in Construction" that successfully took business improvement to parts of the construction sector that were usually untouched by change initiatives. CCI draws upon University expertise to deliver workshops on IT in construction, supervisory management and benchmarking as their part of this network.

CCI has been successful in a DTI 'Partners in Innovation' bid to deliver Benchmark Index assessments (CBPP, 2001) to 50 regional SMEs. This project is run in conjunction with the NW region of the CITB and the Construction Best Practice Programme and has seen the establishment of a network of construction aware business advisors from all the business links in the region. Furthermore CCI has now helped facilitate a programme of training for these Business Advisors to raise their awareness of the industry and the principles of Rethinking Construction and to also enable them to draw on the expertise and resources of Rethinking Construction and the CBPP.

A government sponsored business benchmarking tool, the Benchmark Index enables CCI to measure the performance and improvement of regional construction companies. A key role of CCI is to provide tools to enable this improvement. Innovation itself is a category that is assessed within the Benchmark Index. CCI are now conducting an analysis of the Benchmark Indexes that it has con-

ducted and it will be interesting to measure the correlation between innovative companies and business success. This link between profitability and innovation would be an interesting area for future research. The Benchmark Index would provide a useful source of data for this activity.

In 2003 CCI extended its work with the CITB by the provision of a series of 36 workshops around Rethinking Construction themes and to increase dramatically the number of Benchmark Index assessments that have been completed. Attendees at these workshops have also been offered the opportunity of completing their European Computer Driving Licence free of charge, and to date over 100 people have taken this opportunity.

In the specific area of innovation CCI is working with Technet. Technet is a NW initiative that is a 'network of networks' linking together inventors groups with industry and other organisations that provide independent advice on issues such as intellectual property rights and patenting. An example of how this collaboration has led to the adoption of innovative technology is the use of a new method of laying railway track. This project evolved from an inventor who was a member of an inventors club. The inventors club approached CCI to gauge the interest from industry in the proposed new method. CCI was able to put the inventor in touch with the company working on the Blackpool tram system and the innovation is now being piloted.

3. INCREASING UNIVERSITY AND INDUSTRY COLLABORATION

As a mechanism for innovation it has been noted in previous research (Gann, 1997) that 'universities play a particularly important role because they carry out both R&D and teaching', and are responsible for postgraduate education and teaching and therefore can provide direct routes for transfer of technological and process innovations which CCI as an innovation broker may not be able to achieve alone.

The creation of a learning industry will be supported by strong, collaborative research ventures such as this which will assist in the delivery of performance improvements identified in national and industry policy. In this section we consider CCI research activity and also the scope for collaboration with other universities.

3.1. CCI research activity

CCI values research and conducts research contracts directly and facilitates industry and academic collaboration for a range of its partner organisations. CCI support and enable a number of research activities carried out by University of Salford, University of Manchester, Lancaster University, Liverpool JMU and the University of Central Lancashire. This research activity provides direct support and links to the other service areas of the Centre in seeking innovative solutions to business problems and business development. Specific projects that the CCI have worked upon include:

- A project undertaken for Manchester City Council reviewed construction activity within the Greater Manchester area. This research is intended to provide ongoing measurement to identify trends and measure improvement through initiatives such as LA21 and skills based and local employment issues (Abbott and Allen, 2002). The outcome is to be able to identify future deficiencies in skills and to facilitate skills training in anticipation, as well as to ensure that good words are put into practice through MCC works.
- Two Engineering and Physical Sciences Research Council (EPSRC) funded research projects in conjunction with University of Salford that address some key aspects of the Rethinking Construction projects. “Trust in Construction: Achieving Cultural Change” and “Integrating the Supply Chain – the impact of changed procurement systems on the structure of the industry”.

- CCI is the technology transfer centre for the EC funded European-wide Constrinnet project and the launch events have been hosted at CCI. This brings CCI direct access to a wider field of best practice within the construction industry in Europe.
- The North West Development Agency (NWDA) Innovation Team use CCI as their point of reference for construction related research. Two examples include a study into the use of robotics in the construction industry and the design of housing for independent living.
- CCI publish a series of reports / working papers in their own name. To date documents have been produced on Web Enabled Project Management (Alshawi and Inguranath, 2002), A Review of PFI and PPP (Allen *et al.*, 2002) and Trust in Construction (Swan *et al.*, 2003). Future titles include ‘Benchmarking in Construction’ and ‘Affordable Housing in the UK’.

This research provides a focus for CCI activity and permits staff to develop their skills and knowledge of the industry and is useful in network development and identification of key regional players. Collaborative research projects provide an opportunity for industry and universities to become more closely aligned and they support other CCI consultancy activities.

3.2. CCI collaborating with other universities

The CCI has an important role to play in facilitating such collaborative research in the region. The support they provide is usually by way of facilitating meetings, enrolling appropriate Industry partners for the research works and publicising research outputs. Collaboration between CCI and universities through joint research and development opportunities for post-graduate students can create a greater

synergy for the benefit of the whole industry and create this direct route for technology transfer.

Working with other universities potentially provides an additional resource for CCI to undertake collaborative research projects. The CCI through its network can bring together key industry players with critical thinkers at universities in the development of innovative solutions to business problems and improvement initiatives.

4. EVALUATING OUTCOMES

Evaluation of their activities is important to CCI. Key questions that must be considered include:

- how do CCI evaluate what they do?
- how can they be more effective?, and,
- can we identify evidence of success.

Within CCI evaluation is on-going and is undertaken in a variety of formats. An attempt has been made for evaluation to be an ordinary everyday part of what CCI do (Wadsworth, 1997). A number of specific evaluation activities that take place and are subject to both internal and external review are illustrated below:

1. At every twilight seminar and the twice yearly debates a feedback form is provided to delegates that can be left at the end or posted back to the centre administrator. A key aspect of these forms is suggestions for specific topics to be covered in future events. This is important as it helps the Centre be responsive to the needs of their membership and address issues that are of interest to the industry. An archive of these forms now exists from the 21 Twilight Seminars and 3 debates that have been staged. This is now an everyday part of CCI activity.
2. In addition to this a customer satisfaction survey was undertaken in 2001 with 30 collaborating organisations completing the survey form. This was specifically undertaken to provide feedback to the CCI fund-

ing agencies to illustrate the extent of activities and success rates that were being achieved. Again, it is intended that this becomes an ongoing activity and the early surveys will provide a benchmark for future evaluation and performance improvement.

3. CCI's core funding continues to be provided by the European Regional Development Fund (ERDF). This funding is conditional on CCI meeting agreed targets and milestones on an ongoing basis. In the first 18 months of its existence CCI worked with 150 SME's, assisted in the creation of 2 spin out ventures, helped to take 2 new 'products' to market (a waste wood recycling system and a supply chain management tool) and participated in a number of placement schemes. These targets are reviewed and increase annually.
4. On an annual basis CCI involves all of its team and key stakeholders in its business review and planning process. This is done by facilitated away days that enable all to reflect on the successes and failures of the previous year and to plan future growth activities.

A useful aspect of these activities is that it can identify areas where CCI is doing well, but maybe more importantly in identifying areas that could be improved upon or changed to meet the specific need of participants. An example of this was feedback from CCI's initial work with CITB on IT in construction. This feedback highlighted a requirement for supervisory management training, for which a programme was developed by CCI. This programme was subsequently oversubscribed, the feedback from which has led to the development of a more comprehensive range of training that is currently being delivered.

5. DISCUSSION AND CONCLUSIONS

The Centre has now been in existence since October 2000 and in each successive year grant

income and fee income have increased. This has led to a growth in the number of staff employed and a continuing growth in 'footfall' of visitors to the centre, electronic queries and requests for information and traffic on the website which has been identified as a key source of up to date industry related information in feedback sessions. A business plan is in place and an illustration of the maturity that the Centre is reaching is evident in quantifiable targets that relate to SME's assisted, business networks assisted, new jobs created, jobs safeguarded, sales increased, sales safeguarded and new business networks created. These targets illustrate the desire to impact upon and assist the industry in the region and make tangible improvements to the economic wellbeing of the region.

This case study illustrates how CCI provides a link between the University sector, industry, national bodies and business support organisations on a regional basis. Much of what has been achieved could be reproduced in other regions. In other regions the interplay between the different interest groups and the peculiarities of the economy and construction sector would combine to create a different need and a different solution. Experience of the CCI in the NW can be considered a good example of what can be achieved.

Rethinking Construction and the Construction Best Practice Programme provide an excellent resource and knowledge base that universities can draw from and contribute to. However, it is also important to understand that the centre was built around already existing networks containing enthusiastic individuals with a willingness to work co-operatively to drive industry improvement. It is important to build on regional strengths and this aspect should not be ignored in the formation of similar centres.

Ultimately by CCI collaborating with Universities there will be an opportunity to integrate teaching, research and practice more effectively than is currently the case. This paper has illustrated the framework that is in place

which will hopefully be built upon and developed in the future and will play an important role in the development of a strong, competitive and viable learning industry in the region. As a final point it is worth noting that the consulting and research activity of CCI has seen a development of eminently transferable skills and knowledge between public and private sector clients. This provides a framework for knowledge dissemination, exploitation and hopefully innovation.

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SANTRAUKA

INOVACIJŲ SKATINIMAS: Statybos inovacijų centro vaidmuo

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Šiame tyrime apžvelgiama Statybos inovacijų centro veikla, išryškunami lemiami sėkmės faktoriai, susiję su bendradarbiavimo centrais ir inovacijų brokeriais, kai universitetai ir pramonė dalijasi žiniomis. Tyrime taip pat aiškinamas nacionalinis kontekstas, kuriame centras susikūrė.

Aptariama, kaip centras pristato žinias ir pramonės aplinkos kūrimo priemones, skatinančias inovacijas. Centras suburia pramonininkus ir mokslininkus kaip įvairių disciplinų atstovus įvairiausiuose geriausios praktikos švietimo ir mokymo procesuose, seminaruose bei įmonių renginiuose, šitaip skatindamas keistis informacija mokantis, diskutuojant ir dalijantis patirtimi.

Centras pripažįsta, kad tarp projektų, organizacijų, žmonių ir sutarčių esti sudėtingų ryšių, o tai savo ruožtu yra ir įmanomų, ir pageidautinų dalykų atsiradimo prielaida. Bendradarbiavimo procesas, kuriuo siekiama pageidautinų rezultatų, suponuoja kultūrinį vertinimą ir kultūrinę raidą tiek tarp organizacijų, tiek organizacijų viduje. Palengvinti šį procesą yra pagrindinis centro uždavinys.

APPENDIX. USEFUL WEBSITES

Centre for Construction Innovation, <http://www.ccinw.com>

The CCI website illustrates the full range of CCI activities and show how it works on a regional basis with the NWDA to implement the national policies of the UK government through Constructing Excellence#

Constructing Excellence,
<http://www.constructingexcellence.org.uk>

Constructing Excellence is the national industry improvement organisation that has now brought together Rethinking Construction and the Construction Best Practice Programme. CCI is the regional centre for this organisation and uses the tools and advice provided by Constructing Excellence on a regional basis.

Northwest Development Agency (NWDA),
<http://www.nwda.co.uk>

The NWDA is the Regional Development Agency under which CCI is situated. This is the nearest equivalent to regional government for England. Regional Development Agencies have as their aim increasing Regional GDP.

Construction Innovation Brokers
Construction Technology Centre Atlantic (CTRA)
<http://ctca.unb.ca>

Cooperative Research Centre for Construction Innovation (CRC-CI) <http://www.construction-innovation.info>

Building Research Establishment (BRE) <http://www.bre.co.uk>

Centre Scientifique et Technique du Bâtiment (CSTB) <http://www.cstb.fr>