

# URG(B)E

Report by **The URG(B)E Curriculum Working Party**

**Rethinking the Construction Process: Focusing the Construction Curriculum**

## Rethinking Construction

- > Product Development
- > Production of Components
- > Partnering the Supply Chain
- > Project Implementation

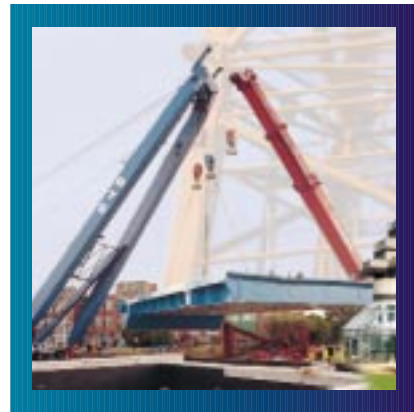
**Andrew Price** Loughborough University (*Chair*)  
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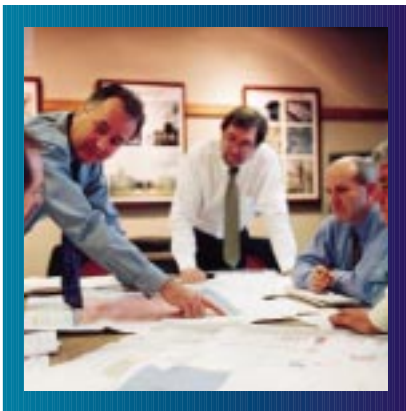
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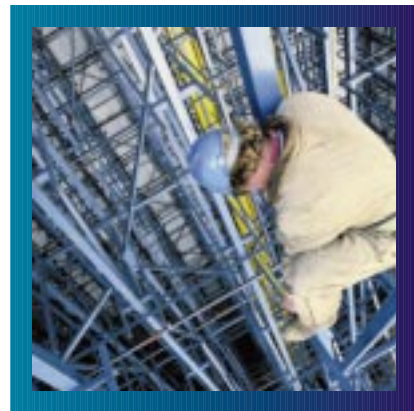
**Theme B: Production of Components**



**Theme C: Partnering the Supply Chain**



**Theme D: Project Implementation**



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Note: The URG(B)E membership comprises the universities with the highest research gradings in the Built Environment. The individuals listed above represent those universities and are the main contact points.

The activities of the URG(B)E members are summarised on the web site of the Built Environment Research Network located at <http://www.bern.ac.uk>

# Foreward

In 1998, the Universities with the highest research gradings in the Built Environment came together to respond to research policy documents on which a University view was required. Subsequently, the group have been asked to help lead policy initiatives from the University perspective and to assist in the dissemination of knowledge and encouragement of take up of work being undertaken by the construction industry and particularly M4I and the *Rethinking Construction* initiative. Although the University Research Group for the Built Environment (URG(B)E) is an informal organisation, it has taken on this role and wishes to use its expertise and knowledge for the benefit of the whole of the **UK University research base for the Built Environment** and the **Industry** itself.



This volume is the first output from the group and provides an outline curriculum for the topics which can be found in the *Rethinking Construction* report for adoption in all courses related to the Built Environment. For those who might find it helpful a full module is provided which could be included in the curriculum of many Built Environment courses. Some courses will already cover much of the content in a different manner. It also provides references to the source material for the curriculum and the major organisations involved. This document is not meant to be prescriptive but to encourage take up of the ideas in the report as requested by both government and industry. It has the full backing of the DETR and the M4I and we are grateful to the government for providing the monies for publication. It also has the support of the major professional institutions that are helping to circulate it among their members.

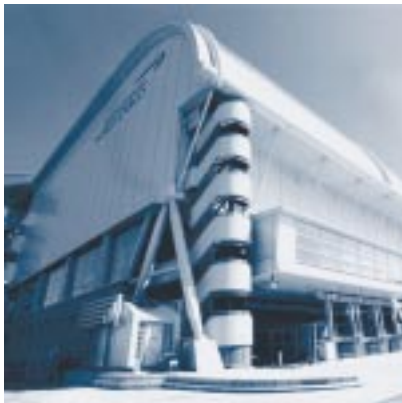
We hope you will find the document not only helpful but interesting and above all a stimulant to *rethinking* the design and construction process for the benefit of the whole industry and its clientele.

I would like to thank the working party under the Chairmanship of Professor Andrew Price from Loughborough University for the excellent work they have done in putting this document together.

Professor Peter Brandon  
DSc MSc FRICS ASAQS Co-ordinator of URG(B)E

# Executive Summary

The main aim of this report is to encourage programme providers within the Built Environment to take a more proactive approach to the adoption of *Rethinking Construction* concepts within existing and future programmes. As a starting point, an Exemplar Module Specification and a Teaching Schedule have been developed. These will have to be modified to take into account the desired learning outcomes of individual programmes. The report reviews recent developments and initiatives that have encouraged the construction industry to both adopt the important cultural philosophy that customer satisfaction is inseparable from business goals and view performance in terms of safety, cost, quality and sustainability. The roles of the key organisations charged with driving the through change have been summarised. The three Appendices to the report describe: Supporting Information; EU/UK Government Education Initiatives; and Educational Networks. They also include several web sites that provide detailed information to support this report. These web sites can be used to obtain Demonstration Projects to support individual lectures or be used to identify potential funding sources to support the development of new programmes. The report's main findings and recommendations have been summarised on the next page.



- There is a wide diversity of undergraduate and postgraduate programmes associated with the Built Environment. These have undergone significant change in recent years as a result of both educational and industrial pressures. The process of change has often been hindered by the long lead-in time associated with the accreditation process and the bias within some professional institutions towards traditional subjects. If new and innovative concepts are to be adopted, programme providers must proactively strive to influence the strategic thinking of the professional institutions.
- The construction sector has undergone considerable change in recent years and this will continue into the foreseeable future. This change started with the recognition that TQM is an important business philosophy and customer satisfaction is inseparable from business goals. Construction has subsequently become more conscious that performance can be measured in terms of safety, cost and quality.
- Construction sustainability is rapidly becoming a critical performance measure. Close synergy exists between sustainability issues and performance improvement as presented in *Rethinking Construction*. Further changes are required to improve construction efficiency and sustainability in order to meet clients' expectations.
- The process of change has been encouraged by several Government supported initiatives such as the Latham, Egan and Rogers Reports. These initiatives have established targets and provided recommendations for improving construction efficiency and sustainability.
- Latham highlighted that there had been little in the way of follow-up action on previous reports, however, several bodies have been established to encourage the take up of recommendations by Latham and Egan. The DETR, CIB, CIC, M4I, CBPP, Housing Corporations and Housing Forum are assisting to drive forward change.
- An **Exemplar Module Specification** and a **Teaching Schedule** have been developed to help programme providers develop programmes that embody the recommendations contained within *Rethinking Construction*. This specification has been structured around the four main Egan themes of: Product Development; Production of Components; Partnering the Supply Chain; and Project Implementation. The exemplar is intended to provide a starting point. Programme providers should modify the exemplar to suit the desired learning outcomes of their individual programmes.
- In the short term, the recommendations from *Rethinking Construction* could be contained within an individual module as demonstrated by the exemplar. However, the long-term aim should be to embody the findings throughout individual programmes within the Built Environment. A modified version of the Exemplar Module Specification could initially be taught in the final year of undergraduate programmes and subsequently permeate through whole programmes.
- The internet has become a major source of information and several web sites provide access to Demonstration Projects, case studies, innovation and good practices that could be used to support *Rethinking Construction* related teaching both in the short- and long-term. Various web-based sources of information have been identified and summarised.
- Life-long learning has an important role to play in creating a culture conducive to improving construction efficiency and sustainability. The new generation of EU Education and Training Programmes attach considerable importance to life-long learning. It is recommended that funds be sought from these new programmes to ensure that *Rethinking Construction* becomes a key ingredient to life-long learning and the National Record of Achievement within construction.
- The DfEE has recently awarded six Demonstration Projects under the "theme for Higher Education Development Projects for the period 1998 - 2000" and the UK's four Higher Education funding bodies recently committed £30 million over five years to 24 dedicated LTSN Centres. It is intended that networks providing common teaching material will emerge from these and other initiatives. It is recommended that these initiatives be used to develop common teaching material based upon *Rethinking Construction*.





# 1.0 Introduction

## 1.1 Aim of the report

URG(B)E is the University Research Group for the Built Environment comprising all University Groups that gained a Grade 4 or more in the most recent Research Assessment Exercise. A Curriculum Working Party was established by URG(B)E with the remit of producing a report that would encourage programme providers within the Built Environment to take a more proactive approach to the adoption of *Rethinking Construction* concepts within existing and future programmes. Following a series of meetings and consultation with industry representatives, this report was produced.

## 1.2 Target audience

The main target audience is still programme providers including Heads of Departments, Programme Directors, Module Leaders and Lecturers. However, the target audience has expanded since the initial brief and the report provides some valuable information that could be used by all students within the Built Environment to supplement their studies. The report will also help to raise awareness of *Rethinking Construction* within the industry and provides Human Resource and Training Managers with information that would be extremely useful when assessing training requirements throughout their individual organisations. The report will help researchers and projects students to more readily access a wide variety of information from several highly informative web sites.



## 1.3 Guide to the report

An **Exemplar Module Specification** and **Teaching Schedule** have been developed and are presented in Section 5 of this report. These provide an excellent starting point for programme providers wishing to implement *Rethinking Construction* within their programmes. Section 2 reviews recent developments and initiatives that have been the main drivers to change within construction. The synergy between sustainability and performance has been highlighted within this review. There are many organisations assisting to drive through change. The background to some of the key organisations, their roles and the type of information provided have been described in Sections 3. The **Exemplar Module Specification** and **Teaching Schedule** were the result of a full one-day workshop and several follow-up meetings. Considerable thought was given to the brief and how best to encourage take up of *Rethinking Construction* by programme providers. The curriculum development issues taken into account have been summarised in Section 4. There are three appendices to the report: Supporting Information; EU/UK Government Education Initiatives; and Educational Networks. These three appendices include several web addresses that could be used to obtain more detailed information to support individual lectures or to identify potential funding sources for the development of new programmes.

## 1.4 Undergraduate and postgraduate curriculum

The past ten years have brought significant changes to both undergraduate and postgraduate curriculum within the Built Environment. There has been a move towards modular and semesterised programmes with increased flexibility to reflect the needs of both student and employees. Rapid developments in Information Technology have facilitated greater application of Computer Aided Learning. The importance of experiential learning has been recognised, resulting in increased teamwork and group projects.

These factors have had significant impact upon how students are taught. Examples of recent educational initiatives have been introduced in Appendix B. Given the long lead-in time associated with the accreditation process and the bias within some professional institutions towards the traditional subjects, programme providers need to take a more proactive approach to curriculum development if new and innovative concepts are to be adopted. This proactive approach would have to involve concerted effort aimed at influencing the strategic thinking of the professional institutions.

## 1.5 Emergence of Total Quality Management

Over the last 20 years, new management tools and methods have been developed to help improve competitive performance in delivering products and services to customers. Total Quality Management (TQM) techniques have filled the quest for new competitive tools and have found many successful applications within many industrial sectors. This has led to awareness that TQM has the important cultural philosophy that customer satisfaction is inseparable from business goals. Although the construction industry is often reluctant to adopt external models, there have also been significant changes in the management of construction processes and the industry has become more conscious of performance in terms of safety, cost and quality. This process of change has been encouraged by several Government supported initiatives as Latham and Egan.

## 1.6 Emergence of Sustainable Development

Since the publication of *Rethinking Construction*, sustainability issues have attracted considerable attention. This has resulted in many reports and initiatives aimed at improving construction sustainability. This report takes into account these recent developments within a *Rethinking Construction* context.

# 2.0 Drivers for Change

## 2.1 Recent developments

The construction industry has considerable bearing on the wealth and quality of life of the nation. It is central to the national economy because it is used to deliver new homes, regional regeneration, modern transport facilities and a wide range of other public infrastructure. The provision and maintenance of buildings accounts for more than 10 per cent of the total UK gross domestic product; construction and associated manufacturing industries employ about 14 per cent of the UK workforce; and there is currently a trade deficit of £1.8 billion on imported construction materials and components. The construction industry has thus been of considerable concern to several UK governments who have become more proactive and driven the agenda through several initiatives. Recent years have seen successive Governments support several initiatives and commission reports aimed at improving construction performance. The final report of the Technology Foresight Panel on Construction (1995), for example, recognised the lack of modern business and management processes in construction and described developments in improving managerial processes as slow and evolutionary. The Latham Report (1994) highlighted many problems associated within construction and the proposed solutions relate closely to the TQM philosophies. Some of these recent initiatives have been discussed within this section. Further details can be obtained from the appropriate Internet sites as presented in Section A.10.

## 2.2 Latham

*The Final Report of the Government Review of Procurement and Contractual Arrangements in the UK Construction Industry* was commissioned jointly between the Government and the industry. Prior to publication of the Latham Report - *Constructing the Team*, an interim report *Trust and Money* was published and outlined the main issues of the Review. Several recommendations were made in the final report including a cost reduction target of 30 per cent. Latham also highlighted that, despite widespread agreement on three previous construction related reports by Simon, Sir Harold Emmerson and Banwell, there had been little in the way of follow up action. As a result of the Latham Report and the Efficiency Scrutiny of Government Construction Procurement (1995), HM Treasury issued a series of several government guidance documents, some of which have been listed in Appendix A. These provide best practice advice at a strategic level relating to the client's role in the construction procurement process. Emphasis is placed upon roles and responsibilities; training and skill development; achieving value for money; and project management. The issues of partnering and incentivisation are also covered.

## 2.3 Egan and the Construction Task Force

In October 1997, the Construction Task Force, chaired by Sir John Egan, was commissioned by the Deputy Prime Minister to report on the scope for improving the efficiency and quality of delivery of UK construction; to reinforce the impetus for change; and to make the industry more responsive to customer needs. It published its report, *Rethinking Construction*, in July 1998, with the initiative launched at a conference in November 1998. Although the Task Forces stated that UK construction industry at its best is excellent and its capability to deliver the most difficult and innovative projects matches that of any other construction industry in the world, concern was expressed regarding the:

- under-achievement of the industry as a whole;
- unacceptable level of defects;
- lack of predictability;
- lack of contractor profit;
- need for customer feed-back;
- lack of investment in capital, research, development and training; and
- level of dissatisfaction amongst the industry's clients.

A summary of the report and the Task Force's recommendations are available at the web page listed in Appendix A, however, some of the Task Force's key findings have been briefly listed below.

- The Task Force identified five key drivers of change which need to set the agenda for the construction industry at large: **committed leadership, a focus on the customer, integrated processes and teams, a quality driven agenda and commitment to people.**
- To achieve these targets the industry will need to make radical changes to the processes through which it delivers its projects. These processes should be explicit and transparent to the industry and its clients.
- The industry should create an integrated project process around the four key themes of **product development, project implementation, partnering the supply chain and production of components.**
- Targets for improvement include: annual reductions of 10 per cent in construction cost and construction time; and defects in projects should be reduced by 20 per cent per year.
- Sustained improvement should then be delivered through the use of techniques for eliminating waste and increasing value for the customer.
- The industry must provide **decent and safe working conditions and improve management and supervisory skills** at all levels.
- The industry must design projects for ease of construction.
- The industry must replace competitive tendering with **long-term relationships based on clear measurement of performance and sustained improvements in quality and efficiency.**

## 2.4 Department of Environment Transport and Regions (DETR)

The aim of the DETR is as follows.

*To improve the quality of life by promoting sustainable development at home and abroad, fostering economic prosperity and supporting local democracy.*

The DETR currently spends around £13 billion in pursuit of its policy objectives, £7 billion on housing and regeneration, and more than £4.5 billion on transport. This is expected to rise to nearly £15.5 billion by 2001. The DETR also spends £32 billion in support for English local government's current spending. The Construction Directorate is a part of the Urban Policy, Rural, Housing and Construction Group within the Department of the Environment, Transport and the Regions. The Directorate comprises the following five Divisions and a small Secretariat.

- Construction Industry Sponsorship Division (CIS)
- Construction Innovation and Research Management Division (CIRM)
- Export Promotion and Construction Materials (EPCM)
- Construction Market Intelligence Division (CMI)
- Building Regulations Division (BR)

The DETR promotes improvements in the construction industry's competitiveness and productivity through the Construction Industry Board (CIB). Partners in Innovation (PII) is a DETR collaborative scheme which provides up to half the costs of research and innovation (R&I) projects within the construction sector. The scheme is run as an annual competition and has a budget of £7.5 million for the year 2000. It is open to all UK companies, industry bodies, institutions, research and technology organisations and universities.

## 2.5 The Urban Task Force

The Urban Task Force was established in May 1988 with the following Mission Statement.

*To identify causes of urban decline in England and recommend practical solutions to bring people back into our cities, towns and urban neighbourhoods. It will establish a new vision for urban regeneration founded on the principles of design excellence, social wellbeing and environmental responsibility within a viable economic and legislative framework.*

The resulting Rogers report - *Towards an Urban Renaissance* - is available through the DETR web site listed in Appendix A. The report puts forward an agenda for securing an urban renaissance that has



been encapsulated in ten key objective which strive to create sustainable towns and cities. The report identifies the main drivers that provide the opportunity for urban renaissance to be: technical revolution; ecological threat; and social transformation.

## 2.6 Sustainable Development

The UK Government developed a national Sustainable Development strategy following the 1992 Earth Summit in Rio. This national strategy identifies priority areas for action and is underpinned by a national set of 150 indicators and a sub-set of 14 headline indicators. The four broad aims of this strategy have been summarised below.

- *A healthy economy should be maintained to promote the quality of life while at the same time protecting human health and the environment.*
- *Optimal use of non-renewable resources.*
- *Sustainable use of renewable resources.*
- *Minimise the effects of economic activity on the carrying capacity of the environment and the risk to human health and bio-diversity.*

## 2.7 Sustainable Construction

The process of change was catalysed by the Government consultation paper Sustainable Construction - Opportunities for Change published in 1998. The paper describes Sustainable Construction as the set of processes to deliver built assets which:

- *cause minimum damage to natural and social environments;*
- *minimise the use of resources;*
- *enhance the quality of life; and*
- *will be acceptable to future generations.*

The social, commercial and transport infrastructures that the construction has to interface with were also considered to be important to sustainable construction. Construction must be sustainable in environmental, economic and social terms. In April 2000, the DETR published *Building a Better Quality for life - A strategy for More Sustainable Construction* which highlights the impact that construction has on our quality of life and the environment.

## 2.8 Synergy between sustainability and performance

The Construction Research and Innovation Strategy Panel (CRISP) helps to set the agenda for construction research and innovation. In May 1999, the CRISP Sustainability Construction Theme Group produced their report - *Integrating Sustainability and Rethinking Construction*. Some of the group's main conclusions drawn from a review of key papers and other sectors have been summarised below.

- Construction's main environmental impacts extend beyond the construction phase to include supply chain issues and the effects of post construction activities.
- Construction has an important role to play in shaping viable communities.
- Business is increasingly addressing sustainability issues to enhance the bottom line.
- Given the scale and nature of the construction industry it is a key player in delivering sustainable development.
- The construction industry is lagging behind other industries in its attitude towards sustainability.

The Group went on to identify and analyse sustainability issues that could contribute to performance improvement. Close synergy was found with sustainability issues and performance improvement as presented in *Rethinking Construction*.

# 3.0 Organisations Driving Through Change

## 3.1 Introduction

There are many organisations that are assisting to drive through changes within the construction industry. This section describes some of these organisations and their contribution to the promotion of *Rethinking Construction*. More detailed information can be obtained from their web sites which have been summarised in Appendix A.

## 3.2 The Construction Industry Board (CIB)

The Construction Industry Board (CIB) was established in 1995 to improve the performance of the UK construction industry and implement the recommendations of Sir Michael Latham's 1994 report *Constructing the Team*. Its main objectives were subsequently modified in accordance with the complementary agenda to emerge from the 1998 Egan Report *Rethinking Construction*. It has provided a forum for liaison between suppliers and customers from the private and public construction sectors with central government. Following a fundamental reappraisal of the structure and role review of the CIB during 1999-2000, a framework for a pan-industry strategic body with a new construction and new focus was developed and has been presented in the CIB's report - *A vision for the future* (June 2000). This report can be downloaded from the CIB web site. The new Mission Statement of the CIB is as follows.

*To add value through pan-industry leadership to realise an efficient and successful construction industry that fully meets clients' needs and aspirations.*

The new body will identify and develop policies of strategic importance aimed at improving:

- the quality of resources, particularly people;
- the quality of product;
- the efficiency of operations; and
- the profitability for the firms in the industry; and value for money for clients.

The CIB's membership of the new body comprises five umbrella bodies of the supply and demand sectors of the industry, as listed below.

- Confederation of Construction Clients
- Construction Industry Council
- Construction Industry Employers Council
- Constructors Liaison Group
- Construction Products Association

## 3.3 CRISP

The Construction Research and Innovation Strategy Panel (CRISP) is a part of the CIB and acts as a link between industry, research funders and the research community. CRISP has a wide research remit encompassing all aspects of generating and refining the knowledge that the industry and its clients need to improve the performance of UK construction. It puts these into the context of an industry research strategy.

## 3.4 Movement for Innovation (M4I)

One of the key recommendations contained within *Rethinking Construction* was the establishment of a Movement for Change. The M4I was subsequently established on the 3rd November 1998 to facilitate a culture change and has the responsibility for implementing the recommendations contained within *Rethinking Construction*. M4I's vision is for the whole UK construction industry to create self-sustaining continuous improvement leading to world class performance and increased profitability. Its Mission Statement is as follows.

*To lead radical improvement in the construction industry in: value for money; profitability; reliability; and respect for people through the demonstration and dissemination of best practice and innovation.*

M4I comprises Demonstration Projects, regional Cluster Groups, Working Groups, a Knowledge Exchange and Movement for Innovation Clubs all with the common ambition to both rethink the way in which the industry has traditionally performed and cultivate a culture of continuous improvement. The M4I Board established seven Working Groups to provide focus on the following key issues:

- KPIs and Benchmarking;
- Cultural Change;
- Training, Education and Research;
- Dissemination of the Knowledge Exchange;
- Sustainability;
- Respect for People; and
- Demand/Supply Side Relationships, Client's Role, Partnering and Teamwork.



### 3.5 Construction Best Practice Programme (CBPP)

The CBPP is a new partnership between industry (CIB) and Government (DETR) established to help companies improve their performance and profitability through innovation and best practice. The CBPP raises awareness of the benefits of best practice and provides guidance and advice to UK construction and client organisations so that they have the knowledge and skills required to implement change. The main focus is transformation of outdated management practices and business cultures. The key objectives of the Programme are to:

- create a desire for improvement by identifying, publicising and supporting the use and benefits of adopting improved business practices;
- offer an initial point of contact for organisations wishing to improve;
- facilitate links between such organisations and those with the knowledge of how to improve; and
- provide techniques, advice and knowledge about and tools for best practice.

These objectives are achieved with a variety of services and media.

### 3.6 The Housing Corporation

The Housing Corporation aims to tie its yearly allocation of funds increasingly to compliance with the recommendations of *Rethinking Construction*. The requirements for Egan compliance is set to grow over the following years and reach 100 per cent of allocations of grant funding by 2003/2004. The provision of publicly funded housing has always been the subject of careful scrutiny. Traditional approaches to effective provision have been focused on achieving Scheme Development Standards. However, the DETR and the Housing Corporation have moved towards the inclusion of quality measures to ensure that best value for money is being obtained for public funding. This has been achieved through the development of the Housing Quality Indicator (HQI) system. This is a measurement and assessment tool designed to allow potential or existing schemes to be evaluated on the basis of quality rather than simply on cost. Further details of the system can be obtained from the DETR *Housing Research Summary Number 94, Housing Quality Indicators, 1999*.

### 3.7 The Housing Forum

One of the proposals contained in *Rethinking Construction* was that a "core of projects and the house-building forum should become the basis of a movement for change and innovation in construction". The Housing Forum was subsequently established in 1998 as a three-year initiative supported by the DETR, the Housing Corporation and membership subscriptions. The Housing Forum covers all aspects of housing both in the public and private sectors, including, refurbishment, maintenance, installation and new build. The Housing Forum, along with the Housing Corporation has the biggest influence on the social housing sector and aims to bring together parties involved in the house-building supply chain who are committed and ready to become part of a movement for change and innovation in construction and renovation.

The Housing Forum has:

- established the following Working Groups: Sustainability; Customer Satisfaction; Recruitment, Retention and Respect; and Refurbishment;
- established techniques for setting Key Performance Indicators, Benchmarks and Performance indicators;
- set themes and selection criteria for Demonstration Projects;
- encouraged the introduction of competitive, transparent and accountable Partnering;
- promoted radical changes in business processes; and
- promoted the activities of the Construction Best Practice Programme within the housing sector.





### 3.8 Construction Industry Council (CIC)

The Building Industry Council (BIC) was established in 1988 with five founder members. It evolved into the Construction Industry Council (CIC) in 1990 with 14 members. Since then it has grown in size and influence to become the largest pan-industry body concerned with all aspects of the built environment. At the beginning of October 1999, CIC had 35 full members and 20 associate members representing over 400,000 construction related professionals and more than 20,000 construction firms. CIC members are represented through four Electoral Colleges: Chartered; College of Independent Professional Institutes; Business; and Research. These Colleges nominate representatives to Council and seven Standing Committees. CIC is thus the representative forum for the industry's professional bodies, research organisations and specialist trade associations. It promotes effective links with Government and the implementation of the recommendations and spirit of 'Constructing the Team'. The Council's work covers a wide spectrum of political, practice, research, education, professional development and environmental issues. The CIC champions:

- lifelong learning;
- Sustainable Construction;
- innovation and research;
- adjudication and the nominating bodies;
- training providers; and
- National Vocational Qualifications.

Its Mission Statement is as follows.

*A more effective Construction Industry for Quality and Prosperity in the Built Environment.*

This is supported by the following priorities:

- to serve Society by promoting improved value and quality for clients and users;
- to serve the construction industry by encouraging unity and embracing the significance of the built environment to the nation; and
- to serve members by adding value to their work.

### 3.9 TOPIC

The Training Organisation for Professionals in Construction (TOPIC), originally established by CIC aims to become the strategic body able to define the current and future training needs of professionals in the construction industry and ensure that these training needs are met. During 1999, it was decided to end TOPIC's status as a subsidiary company and re-integrate it within CIC.

TOPIC's mission is as follows.

*To support the provision of high quality training and development for professionals in construction and thereby help them to maintain their competitive edge.*

Through TOPIC, CIC helped to shape the Skills Dialogue and Foresight Reports within the Strategic Forum of Construction NTO's (National Training Organisations). TOPIC is also taking a leading role in with the Construction Industry Training Board (CITB), in developing the Construction Industry Learning Network which is aimed at developing the next generation of learning provision under the banner of the University for Industry. Further details about TOPIC's activities are available on from the CIC web site presented in Appendix A.



# 4.0 Curriculum Development Issues

## 4.1 Introduction

A one-day workshop was held at Loughborough University on Friday 8th October 1999. The initial brief of the working party was to develop part of a curriculum that encourages the adoption of *Rethinking Construction* within undergraduate and postgraduate programmes. The workshop comprised several brainstorming and development sessions around the following: issues relating to the best way of satisfying the brief; important issues raised by *Rethinking Construction* that need to be taken into account; previous relevant work; learning outcomes and skills required from existing programmes; structure of existing programmes; and the development of a module specification. The results of these sessions have been summarised within this section.

## 4.2 Issues relating to brief

The following issues were raised and considered along with the scope of initial brief. Many of these issues raised should be considered during the review of existing programmes and the development of new programmes. It was recognised that programmes could not be changed overnight partly due to requirements of accreditation by professional institutions, however, students should be encouraged to question and challenge traditional processes.

- In many programmes, particularly those emphasising management in construction, *Rethinking Construction* will permeate through the whole curriculum.
- Concern was initially expressed that no single module could cover, in sufficient depth, all the issues raised by *Rethinking Construction*.
- Variable quality of existing programmes with respect to entry qualifications with a large diversity of skill.
- How could or should common learning objectives be developed that satisfy the needs of diverse programmes?
- Subject areas are different but there are central themes that run through.
- Why has Construction Management evolved as a separate management discipline compared to management as traditionally taught by Business Schools?
- Concepts must go through thread of programme. If concepts are grafted onto existing programmes there could be a potential mismatch.

- The importance of stakeholders within individual programmes was emphasised. Stakeholders in Architectural programmes could be considered to be culture and cities. The requirements of most stakeholders are for skills developed from training.
- Someone has to do the day-to-day activities - teaching students the way things are prepares them for reality. There could be a mismatch between expectations of industry and students' learning.
- One or two modules may not be sufficient change the skills required to meet stakeholders' current needs.
- New graduates need to be up and running as soon as possible.
- Many existing programmes already have *Rethinking Construction* ideas already embodied within them.
- An **Exemplar Module Specification** could be developed and introduced as an initial response.
- Industry culture must be tackled from the top down and through CPD.
- Professional institutions may not be moving fast enough.
- View may change and new ideas evolve in the future.

## 4.3 Issues raised by *Rethinking Construction*

It was recognised that industry is responding to *Rethinking Construction* and adopting many of its recommendations. The main issues raised by *Rethinking Construction* that should be taking into account by programme providers were brainstormed. It was recommended that although the issues raised by *Rethinking Construction* would best be delivered across a wide range of modules within individual programmes, this may take some time to evolve due to the constraints of accreditation. To help with the transitional phase, an **Exemplar Module Specification** that focuses upon how processes are evaluated and challenged was considered to be a good starting point.



## 4.4 Previous work

The importance of building off previous work by Latham and CIB was emphasised, but it was considered that this needed to be expanded upon and developed taking into account *Rethinking Construction*. The following three potential routes were identified and discussed. It was agreed that new modules or programmes could be structured around:

- the learning outcomes developed by the CIB and CIC in response to the Latham Report;
- Project Process Protocol; or
- the M4I Process Model.

The overlap between Egan and Latham was highlighted. The value of CIB's common learning objectives, developed following Latham and a memorandum of understanding with 15 professional bodies, was acknowledged. However, it was recognised that the depth of approach taken on individual programmes should be decided by the programme leader in conjunction with accrediting bodies. *Rethinking Construction* has encouraged people to think deeper about the processes they adopt. This should be reflected in the learning theories adopted by programme providers. The M4I Process Model was considered the most appropriate way forward due to its structure, its close association with *Rethinking Construction* and the availability of structured information via the *Rethinking Construction* PORTAL.

## 4.5 Requirements of existing programmes

There are many undergraduate and postgraduate degree programmes associated with the Built Environment. These range from Architecture to Civil Engineering. The topics covered by these programmes have traditionally ranged from very conceptual design to detailed engineering design and construction. However, the construction industry is aware of the need to adopt a more integrated approach. This has resulted in increased interdisciplinary activities and the boundaries between different disciplines have started to disappear. The learning outcomes required from different programmes were brainstormed. A considerable amount of overlap was found to exist across a diversity of programmes; skills that contribute to the main functions of an individual organisation were considered to be very important. Although *Rethinking Construction* has encouraged alternative processes to be considered, the importance of skill development was also emphasised. Some of the issues associated with the required learning outcomes of individual programmes identified during the workshop session have been listed below.

- Design Technology
- IT and communications
- Teamwork and interpersonal skills
- Creativity and sound knowledge base
- Appreciation of skills
- Engineering design
- Health and safety
- Management
- Awareness of commercial and legal aspects
- Importance of CPD and lifelong learning

## 4.6 Structure of existing programmes

Module specifications and programme regulations from four universities were reviewed to ensure that any proposals developed by the working party were consistent with existing structures. These provided a framework to the **Exemplar Module Specification**. It was observed that:

- modules were generally weighted at 10 credits and could be roughly translated into 100 hours of student effort;
- undergraduate programmes generally comprised 120 credits per year; and
- postgraduate programmes generally comprised 180 credits per year.

## 4.7 Development of module specifications

The working party endorsed the approach of specifying learning outcomes, but recognised that these needed to be taken further and produced the enclosed **Exemplar Module Specification and Teaching Schedule**. In developing these, the working party took into account the learning outcomes and skill requirements associated with existing programmes along with existing programme structures. However, due to the diversity of topics covered, it is recommended that students should have prior knowledge of how the construction industry operates today. It is therefore recommended that the **Exemplar Module Specification and Teaching Schedule** are initially used to develop modules that would be taught during the final year of an undergraduate programme or within a postgraduate programme. Modification will be required according to the desired learning outcomes associated with individual programmes. However, the module has been developed around the following key learning outcomes which are relevant to all degree programmes within the Built Environment and on completion of this module, students should be able to:

- appreciate the softer issues related to teamwork, leadership and partnering throughout the supply chain;
- critically analyse construction processes;
- assess design, economic and sustainability implications on a whole life basis;
- make value judgements and develop optimal solutions; and
- identify and develop alternative strategies based upon Lean Thinking as endorsed by *Rethinking Construction* - the principles of the value stream, flow, pull and perfection.







#### 4.8 Integration within existing modules

In the long term it is recommended that *Rethinking Construction* is embodied throughout individual programmes. The **Exemplar Module Specification** could initially be taught in the final year of undergraduate programmes and subsequently permeate through the whole programmes. Prerequisite modules may evolve. The **Exemplar Module Specification** could also be used at postgraduate level either as an individual module, or as a whole programme based upon the above learning outcomes and structured around the four main *Rethinking Construction* themes of *Product Development*; *Production of Components*; *Partnering the Supply Chain*; and *Project Implementation*. These could each be expanded upon to develop individual postgraduate modules based on the contents provided.

#### 4.9 Dissemination

There are many educational developments already taking place that could be used to increase the take up of *Rethinking Construction*. The Internet based Demonstration Projects and the Knowledge Exchange provide exciting opportunities for educational providers to engage with live material. Some of these have been introduced in Appendix A. It is recommended that **Exemplar Module Specification** and other supporting material are made available to:

- the Educational Demonstration Projects funded by HfEE under the Theme of Recording Achievement;
- the appropriate Learning and Teaching Support Network Centres funded by the funding bodies for Higher Education in the UK;
- Regional Centres such as the Centre for the Urban Environment;
- Professional Institutions; and
- libraries such as The RIAS Distance Learning Library.

#### 4.10 Programme for implementation

This report has identified issues that would have to be considered to ensure successful integration of *Rethinking Construction* into Educational Programmes. In particular:

- the need for the concepts emerging from *Rethinking Construction* and M4I to be a thread running through undergraduate and postgraduate programmes rather than as a bolt on extra; and
- the need to persuade professional institutions to review and amend their accreditation frameworks. The CIC appears to be well placed to take this work forward with the active support of M4I and CBPP in co-operation with the academic community.

#### 4.11 Constraints

The report has been based on a limited and selective set of inputs. It is important therefore to set carefully the wider economic, cultural and commercial background and context to enable the **Exemplar Module Specification** to achieve the desired results. It is important to emphasize that, at both undergraduate and postgraduate levels, there should be a critical reading of *Rethinking Construction* and associated material. The Egan Report contains a *rethinking* of the issues but it is not the only view. There has been a heated debate concerning the adequacy of the initial *Rethinking Construction* agenda. Concern has been expressed regarding the emphasis given to process issues at the expense of sustainability and people issues. While this debate is still active, the authors to this report offer the view that there is enough concern for implementation to begin. It is thus essential to view the curriculum as dynamic and subject to frequent and robust review (both in academic content and learning outcomes). The developed should of course be subject to continuous review and improvement.

# 5.0 Exemplar Module Specification

## 5.1 Module details

### Module title:

Rethinking the construction process.

### Level:

Undergraduate final year - Postgraduate.

### Prerequisites:

Students must have been taught current design, engineering and management processes pertinent to the construction industry. They must also have a good understanding of how the industry works today.

**Module weight:** 10 Credits

**Student effort:** 100 Hours

## 5.2 Aims

The aim of this module is to encourage students to question traditional construction processes and be creative in developing lean construction strategies and processes.

## 5.3 Key learning outcomes

On completion of this module, students should be able to:

- appreciate the softer issues related to teamwork, leadership and partnering throughout the supply chain;
- critically analyse construction processes;
- assess design, economic and sustainability implications on a whole life basis;
- make value judgements and develop optimal solutions; and
- identify and develop alternative strategies based upon Lean Thinking as endorsed by *Rethinking Construction* - the principles of the value stream, flow, pull and perfection.

## 5.4 Method of teaching and learning

**Teaching schedules** have been presented in Sections 5.7 to 5.10. Total student effort on this module should be 100 hours on average. A combination of lectures, seminars and case study exercises (normally three hours per week over 11 weeks) should be used. The remaining time for directed learning, coursework assignments and revision.

## 5.5 Assessment

A combination of coursework and examinations will be used to reflect the key learning outcomes.

## 5.6 Content

The module will critically analyse and compare construction processes with those to be found within other industries. The contents of the module have been structured around the four P's as summarised below.

### Theme A: Product Development

Trends in construction and the development of branded construction products. Traditional construction models. Product development processes with other industries. Market analysis and models of investment. Product development and whole life costs. Effective processes for innovation and learning through objective measurement of completed projects. Client aspirations, briefing and post occupancy evaluation.

### Theme B: Production of Components

Standardisation and assembly processes across several industries. Environmental, durability, recycling, considerations within the production of components and facilities management. Economic and sustainable implications of standardised components and modular assembly. Detailed planning of the production processes to eliminate waste and improve performance. The influence of lead-in times and just-in-time delivery on project duration. The selection of an appropriate construction strategy. Comparison of site fabrication and off-site fabrication.

### Theme C: Partnering the Supply Chain

Alignment of needs both within the client organisation and throughout the supply chain. Teamwork, leadership, culture, trust and co-operative working practices throughout the supply chain. Partnering and the development of long-term strategic relationships. New models of project coalitions. Benchmarking and performance measurement and sharing the rewards resulting from improved performance. Best value. The transaction environment, e-commerce and their impact upon institutional development. Concurrent Engineering and the contribution by specialists to upstream activities.

### Theme D: Project Implementation

Translation of generic products into a specific project. The briefing process and the development of a product definition. Selection of components and pre-planning the manufacture, construction and commissioning of the product. Concurrent Engineering and the integration of suppliers' activities and systems. The contribution by specialists to upstream activities. Critical thinking and process analysis.

## 5.7 Theme A: Product Development

### Part 1: New product development in construction.

#### Current trends in construction and the development of branded construction products

**Sessions aims:** To develop an understanding of the industry's output (houses, roads etc.) as generic construction products. To appreciate the need for innovative construction products. To explain the process and importance of product development and generation. To develop an understanding of product defects and explain strategies to eliminate sub-standard products. To examine users' and clients' needs in the product development process.

**Reference:** Kagjoglou, M. et al, (1998), *The Generic Guide to the Design and Construction Process Protocol: Final Report*, University of Salford ISBN 090228961999.

Cooper, R.G., (1993). *Winning at New Products: Accelerating the Process from Idea to Launch*, Addison Wesley Publishing Company.

### Part 2: Review of traditional construction models and compare product development processes with other industries

**Session aims:** To compare the new product development processes in manufacturing with traditional construction methods. To develop an understanding of rethinking the fundamentals of construction processes. To introduce the process of lean thinking and demonstrate its benefits for delivering construction products. To critically analyse existing construction delivery models and demonstrate how lessons can be learned from other industries.

**Reference:** Cooper R.G., (1993), *Winning at New Products: Accelerating the Process from Idea to Launch*, Addison Wesley Publishing Company.

### Part 3: Product development and whole life costs

**Session aims:** To gain an understanding of the importance of economic principles in the development of components. To critically examine the importance of models in the consideration of product whole life costs. To review the factors in whole life costing such as initial capital expenditure, durability of the product during the life cycle, maintenance and operational costs of the component, residual values etc. To review the importance of whole life costing in not only the development of the product, but also for the purposes of investment planning and decision-making.

**Reference:** *Whole Life Cost Factsheet* - free from Construction Best Practice Programme. [www/cbpp/factsheets/wlc.html](http://www/cbpp/factsheets/wlc.html)  
*Whole Life Costs - New ISO Standard. CPN (Construction Productivity Network) Report - CPN 801L Abstract CPN801L. Report of joint CPN/CRISP workshop held at the Royal Academy of Engineering, London on 28 January.*

### Part 4: Effective processes for innovation and learning through objective measurement of completed projects

**Session aims:** To develop an awareness of culture of performance measurement so that the efficacy of product innovation could be evaluated and continuous improvements in cost, time, predictability, defects, accidents, productivity and turnover/profits. To consider how product development requires continuity from a dedicated product team with close links to the supply chain through which the skills of suppliers and their innovations can be assessed, and with access to relevant market research. To consider how the M4I Demonstration Projects could be used to assess the performance of the interfaces between the client and the supply chain in achieving high quality product delivery and efficient feedback of important information.

**Reference:** Cooper R.G., (1993), *Winning at New Products: Accelerating the Process from Idea to Launch*.

### Part 5: Clients' aspirations, briefing and post occupancy evaluation

**Session aims:** To explain the measures and processes for evaluating post occupancy. To demonstrate the concept of customer focus as advocated by the lean thinking theory. To demonstrate the process and methods for systematic feedback. To consider how the requirements of the client can be effectively integrated into the critical stages of the development process. To discover how post handover can be put in place to provide all parties with key post occupancy information such as component performance and value for money. To review techniques that can be used to ensure this such as assessing completed projects and customer satisfaction systematically and objectively, and hence feeding this knowledge gained back into the product development process. To consider how the importance of post occupancy evaluation and adequate recording of key performance data can facilitate effective whole of life cost appraisal.

**Reference:** Barrett P. and Stanley C., (1999), *Better Construction Briefing*, Publisher Blackwell Science Ltd ISBN 0-632-05102-7, Construction Industry Publications (CIP) Ltd.

## 5.8 Theme B: Production of Components

### Part 1: Comparison of standardisation and assembly process across several industries

**Session aims:** To develop an awareness of the retail, manufacturing and vehicle production industries and then to consider the production process, diversification of labour and generic component standardisation processes employed in these industries. To critically assess the notion that the principles adopted in other industries can be integrated into the construction industry and the methods which can be used to achieve this.

**Reference:** Davenport T. (1993), *Process innovation re-engineering work through information technology*, Harvard Business Press, Boston.

### Part 2: Environmental, durability, recycling, considerations within the production of components and facilities management

**Session aims:** To consider how the exposure to differing environmental conditions impacts upon the life cycle durability of components and how the ability of components to be recycled efficiently can offset initial costs of production. To develop ideas on how reductions in operational and maintenance costs through the life cycle can be achieved through the production and selection of components that use sustainable materials. To review how effective planned maintenance regimes and monitoring of component degradation through condition ratings can provide profiles on the long-term economic performance of components.

**Reference:** *Environmental technology best practice programme:* <http://www.etbpp.gov.uk>

### Part 3: Economic and sustainable implications of standardised components and modular assembly

**Session aims:** To develop an understanding of the economic trade-off between standard and non-standard building components and review the impact this has upon the freedom of design to satisfy client needs in the optimum manner. To gain an awareness of how a co-ordinated approach to design and construction within the supply chain can lead to better design and less waste. To review and assess the relative economic and sustainability implications of standardisation such as reduced component cost, reduced design effort, predictable component sourcing lead times and predictable site assembly times. To consider the implication that modular assembly restricts the latitude that a client can have on the original design brief and the ability of the design team to meet client expectations based on these restrictions

**Reference:** *Construction best practice programme:* <http://www.cbpp.org.uk>

### Part 4: Detailed planning of the production process to eliminate waste and improve performance The influence of lead-in times and just-in-time delivery on project duration

**Session aims:** To develop awareness of planning techniques such as PERT and Critical Path Analysis as a concept and as a management tool in production planning. To examine management practices and organisational hierarchy systems that can contribute to efficient production practices. To review how life-long learning and continued training can reduce waste and inefficiency. To explore how the delivery and subsequent production of components can affect project duration and how the implementation of lead-in-times (the period between ordering and delivery) and just-in-time can enable the efficient deployment of staff and product delivery. To consider how effective logistics management can reduce project duration and cost. To review the impact of Total Quality Management upon component production.

**Reference:** Lewis J.P., (1995), *Project planning, scheduling and control*, Irwin Professional Publishers, London.

### Part 5: The selection of an appropriate construction strategy. Comparison of site fabrication and off-site fabrication

**Session aims:** To develop an appreciation of the need to develop an effective construction strategy. To develop an understanding of the advantages and disadvantages of pre-fabrication versus on-site assembly. To critically assess the notion that there is significant inefficiency in construction processes and that there is potential for much more systematised and integrated system. To consider how, the relative cost of on-site off-site labour and facilities, security of the supply chain and opportunity for early fixity of design can influence the decision process.

**Reference:** CIRIA, (2000), *Standardisation and pre-assembly: client's guide and toolkit*.

## 5.9 Theme C: Partnering the Supply Chain

### Part 1: Alignment of needs both within the client organisation and throughout the supply chain

**Session aims:** To develop an understanding of typical client organisation needs (delivery certainty, risk avoidance, return on investment, low running costs, customer satisfaction, etc.). To explore ways in which the client organisation needs or business objectives can be established and recorded. To examine how these can be communicated along the supply chain. To consider methods of aligning the supply chain partner best able to provide added value in pursuit of the particular business need with the appropriate client body department or individual.

**Reference:** Handy C., (1993), *Understanding Organisations*, Penguin.  
Ashworth A. and Hogg K., (2000), *Added value in design and Construction*, Longman.  
Clients Construction Forum, (1999), *Survey of construction clients' satisfaction*, CCF.

### Part 2: Teamwork, leadership, trust, co-operative working practice throughout the supply chain

**Session aims:** To develop techniques and strategic policy for the management of and participation in project alliances. To explore the inter organisational and individual needs on construction projects to maximise motivation. To explore ethical business issues and the development of appropriate inclusive leadership styles. To examine the relationship of profit maximisation and equitable distribution in a supply chain. To compare the use of open book soft and hard management processes.

**Reference:** Argyle M., (1994), *The Psychology of interpersonal behaviour*, Penguin.  
Lawrence P. and Elliot K., (1985), *Introducing Management*, Penguin Business.  
Saad M. and Jones M., (1998), *Unlocking specialist potential*, Reading Construction Forum. CIC (2000) *Guide to Project Team Partnering*.

### Part 3: Partnering and the development of long-term strategic relationships - new models of project coalitions

**Session aims:** To critically examine and contrast first and second generation partnering by reference to the differing nature of the coalition; long-term legal and commercial relationships; and the selection, formation and maintenance of strategic relationships. To explore methods for capturing and developing feedback within the coalition and the application of this in the long-term strategy. To develop 'non-project based' management skills (strategic evaluation, managing change, long-term relationships, intra organisation communications, managing continuous improvement).

**Reference:** Micklethwait J. and Wooldridge A., (1997), *Knowledge, learning and innovation in The Witch Doctors*, Mandarin.  
Bennett J. and Jayes, (1998), *The seven pillars of partnering*, Thomas Telford.

### Part 4: Benchmarking, performance measurement and sharing the reward resulting from improved performance

**Session aims:** To develop an understanding of benchmarking as a concept and a management tool. The appropriate use of systems such as CALIBRE and the interpretation and use of output data. To examine performance linked reward systems and the necessary measurement, audit, compliance and transparency requirements. To explore techniques for establishing and setting realistic performance targets (the use of historic data). To understand the requirements of performance linked cost management systems. To explore the concepts and the relationships of value, reward, risk and profit.

**Reference:** Confederation of British Industry, (1997), *Benchmarking the Supply Chain*, Partnership Sourcing Ltd.

### Part 5: The transaction environment, e-commerce and their impact upon institutional development

**Session aims:** To examine and contrast the use of contracts and/or trust to govern construction transactions. Transaction costs in the construction process and to the construction industry. To examine discontinuities between processes and review opportunities for improvement arising from EDI. To review the impact of e-commerce; legal and commercial implications and new appropriate information management and control systems.

**Reference:** Ive G., (1995), *The client and the construction process*, London University. Building Centre Trust, (1999). *Electronic exchange of project information (case studies)*, CRC Ltd.

## 5.10 Theme D: Project Implementation

### Part 1: The translation of generic products into specific projects

**Session aims:** To examine for both products and services the development process and the translation from 'prototype' to 'production run' or systems application. To understand issues that impact on economies of scale, repetition, recovery of R&D costs. To develop a holistic view that recognises the contribution and impact of individual parts on the total product or process.

**Reference:** Gray C., Hughes W. and Bennett J., (1994), *The successful management of design*, University of Reading.

### Part 2: The briefing process and the development of project definition

**Session aims:** To explore the various factors that motivate the project sponsor to commission buildings (direct financial gain, in direct financial gain, social reasons, consumption ) and to recognise the fundamental effect of this on the brief. To develop techniques for understanding and reconciling the aspirations of the various demand side project stakeholders (developer, occupier, funder, user, etc). To develop management skills in editing and translating brief inputs to tangible project criteria (in particular in the definition of quality attributes). To understand the iterative nature of the briefing process and to recognise ways to manage and add value in this.

**Reference:** RIBA leaflet, (2000), *Architects and the Changing Construction Industry*.

### Part 3: Selection of components and pre planning the manufacture, construction and commissioning of the product

**Session aims:** To develop an understanding of planning methods that integrate design, manufacture and construction in a way that captures appropriate inputs at the optimum time in the process. To recognise the potential conflict of suppliers risk and commercial aspirations with the project objectives and to explore appropriate contractual mechanisms to allow this integration to take place. To explore the impact of procurement and purchasing procedures on the design and construction process.

**Reference:** Morton J. and Jaggar D., (1995), *Design and the economics of building*, E&F N Spon.

### Part 4: Concurrent engineering and the integration of supplier's activities and systems The contribution by specialists to upstream activities

**Session aims:** To contrast concurrent engineering with traditional sequential 'over the wall' design methodology. To recognise the differing briefing systems and traditions of designers in the construction industry and to convert this into project based team working that allows productive parallel working. To identify, early in the design process, functional, manufacture, marketing and sustainable project criteria. To develop techniques to communicate design intent with specialists to optimise pre and post design specifications.

**Reference:** Saad M. and Jones M., (1998), *Unlocking specialist potential*, Reading Construction Forum.  
Evbuomwan N. and Anumba C., (1996), *Concurrent engineering in The Structural Engineer* Vol.74, No.5.

### Part 5: Critical thinking and process analysis - the stage gate approach - lean thinking and lean production

**Session aims:** To critically examine the construction, manufacture and design processes and to contrast these with traditional construction management thinking. To move from a focus on contractual and process outcome thinking to exploring and analysing the theoretical base that explains the project process. To explore process rather than product based design and production management theory.

**References:** Ive G., (1995), *The client and the construction process*, London University.  
Saad M. and Jones M., (1998), *Unlocking specialist potential*, Reading Construction Forum, Building Centre Trust, (1999). *Electronic exchange of project information (case studies)*, CRC Ltd.

# Appendix A Supporting Information

## A.1 Introduction

Having developed the **Exemplar Module Specification**, the Working Party set about identifying Demonstration Projects, case studies, innovation and good practice being developed in response to *Rethinking Construction* that could be used to support the module. The M4I, CBPP and The Housing Forum Internet sites were found to provide information on over 200 Demonstration Projects and case studies. The information corresponds to the M4I 5-4-7 model around which the proposed **Exemplar Module Specification** was structured. As the number of projects is growing and new innovations will emerge, it was agreed that an **Exemplar Module Specification** should be used to provide through direction and guidance to relevant Internet addresses rather than recommend specific Demonstration Projects. This appendix also contains several other Internet addresses that also provide some good supporting material. These include Professional Institutions, British Standards, HM Treasury, Government sponsored reports and relevant organisations.

## A.2 *Rethinking Construction* PORTAL - The Knowledge Exchange

<http://www.rethinkingconstruction.org/>

The above site belongs to M4I, CBPP, CIB, LGTT, GCCP and The Housing Forum. The PORTAL permits access, via a shared search engine, to all the information on the web-sites of the participating organisations. It is anticipated that this first PORTAL will provide access to further PORTALS that could comprise educational establishments and commercial companies.

## A.3 The M4I web site

<http://www.M4I.org.uk>

The M4I web site can easily be searched and provides well-structured information and access to the web sites of many construction organisations. Details of M4I's strategy, structure, events and current activities are also provided along with several downloads and links.

### A.3.1 Demonstration Projects

The M4I Demonstration Projects seek to develop innovation. There are currently eight region cluster areas into which the Demonstration Projects are placed. The following details should be provided for each Demonstration Project:

- Project Details;
- The Team;
- Innovations and Improvements.
- Presentations; and
- Links.

Transfer of information obtained from the Demonstration Projects will be achieved with the help of the HEI's through Regional Centres that are currently being established. The M4I currently has a total of 170 Demonstration Projects. These projects have all proposed to develop innovation based on one or more of the four key areas for improvement (Product Development, Project Implementation, Partnering the Supply Chain, Production of Components). Details of the M4I Demonstration Projects can be searched through: a basic search function that involves choosing either a project or a Cluster; a Keyword Search; or an advanced search that:

- starts by selecting and number of Egan's 4P's (*Product Development, Project Implementation, Partnering the Supply Chain and Production of Components*): and
- then refines the search based upon *Industry, Sector, Product, Company, Project Value, Form of Contract and Procurement Route*.

## A.4 The Construction Best Practice Programme

<http://www.cbpp.org.uk/>

The CBPP web site provides details about the CBPP, case studies, events and activities, sector initiatives and a discussion forum. In July 2000, there were 57 case studies on the web site. Most of the case studies relate to the *Rethinking Construction* themes. Each case study focuses upon one of the programmes Business Improvement Themes that are classified as either Business Process Enablers or Project Management as listed below.

### Business Process Enablers

- Benchmarking
- Sustainable Construction
- Culture and People
- Health and Safety
- Information Technology
- Integrating Design and Construction
- Lean Construction

### Project Management

- Partnering and Team Development
- Risk Management
- Standardisation and Pre-assembly
- Supply Chain Management
- Choice of Procurement Route
- Value Management
- Briefing the Team
- Whole Life Costing

## A.5 The Housing Forum

<http://www.thehousingforum.org.uk/>

The Housing Forum's web site provides details of their Demonstration Projects and can be use to obtain a copy of *The Housing Demonstration Project Report - Setting Targets and using KPI's - April 2000*. The Housing Forum's Demonstration Projects involve innovation and improvement including prefabrication, advanced timber frame techniques, water recycling, heat recovery and high technological IT controls. They are: housing projects of any size, new or refurbishment, public or privately funded which, in brief must:

- demonstrate innovation;
- have an established project team who are all committed to the demonstration project process;
- be prepared to share its experiences with others; and
- attend regional cluster meetings.

## A.6 Professional Institutions

The professional institutions' web sites listed below provide regular updates and reports on Egan related issues.

[The Royal Institution of Chartered Surveyors](http://www.rics.org.uk/)

<http://www.rics.org.uk/>

[The American Society of Civil Engineers](http://www.pubs.asce.org/)

<http://www.pubs.asce.org/>

[The American Institute of Architects](http://www.aiaonline.com/)

<http://www.aiaonline.com/>

[The Royal Institution of British Architects](http://www.ribabookshop.com/)

<http://www.ribabookshop.com/>

[The Institution of Structural Engineers](http://www.istructe.org.uk/)

<http://www.istructe.org.uk/>

[The Institution of Civil Engineers](http://www.ice.org.uk/)

<http://www.ice.org.uk/>

[The Chartered Institute of Building](http://www.ciob.org.uk/)

<http://www.ciob.org.uk/>

## A.7 British Standards

<http://www.bsi.org.uk/>

Many of the concepts contained within several British Standards have been reflected in and add weight to the recommendations of both Egan and Latham. BS publications can be ordered from the above web site.

## A.8 HM Treasury

<http://www.hmtreasury.gov.uk/pub/html/docs/cup/procurement/main.html>

There has been an increasing emphasis on Government, in its role as a client for construction projects, to ensure that products and services are procured on a best possible value basis. The following series of government guidance documents were the result of the Latham Report in 1994 and the 1995 Efficiency Scrutiny of Government Construction Procurement. They provide best practice advice at a strategic level for construction procurement process and can be downloaded from the above web site.

- Essential Requirements for Construction Procurement
- Value for Money in Construction Procurement
- Appointment of Consultants and Contractors
- Teamworking, Partnering and Incentives
- Procurement Strategies
- Financial Aspects of Projects

## A.9 Key Reports

The following Internet address provide access to key reports referred to in this document.

[Egan Report - Rethinking Construction](http://www.construction.detr.gov.uk/cis/rethink/index.htm)

<http://www.construction.detr.gov.uk/cis/rethink/index.htm>

[The Rogers Report - Towards an Urban Renaissance](http://www.regeneration.detr.gov.uk/utf/index.htm)

<http://www.regeneration.detr.gov.uk/utf/index.htm>

[DETR Report - Sustainable Development: Opportunities for Change Sustainable Construction](http://www.environment.detr.gov.uk/sustainable/construction/con_sult/index.htm)

[http://www.environment.detr.gov.uk/sustainable/construction/con\\_sult/index.htm](http://www.environment.detr.gov.uk/sustainable/construction/con_sult/index.htm)

[DETR Report - Building a Better Quality of Life: A Strategy for More Sustainable Construction](http://www.construction.detr.gov.uk/cirm/sustainable/bql/index.htm)

<http://www.construction.detr.gov.uk/cirm/sustainable/bql/index.htm>

[CRISP Report - Integrating Sustainability and Rethinking Construction](http://www.crisp-uk.org.uk/reports/isrc_sum.htm)

[http://www.crisp-uk.org.uk/reports/isrc\\_sum.htm](http://www.crisp-uk.org.uk/reports/isrc_sum.htm)

[Local Sustainability: European Good Practice Information Service](http://cities21.com/coldfus/citylist.dbm)

<http://cities21.com/coldfus/citylist.dbm>

[DETR Housing Research Summary No 94. Housing Quality Indicators \(HQI\) 1999](http://www.housing.detr.gov.uk/hrs/)

<http://www.housing.detr.gov.uk/hrs/>

[Latham: Construction the Team](http://www.cic.org.uk/information/publications/otherpubs.htm)

<http://www.cic.org.uk/information/publications/otherpubs.htm>

[Agenda 21](http://www.sustainablecity.net/LA21/Sustainable%20City/la21incambridge.htm)

<http://www.sustainablecity.net/LA21/Sustainable%20City/la21incambridge.htm>

## A.10 Key Internet sites

Additional information to support the Exemplar Module Specification can be obtained from the following.

**DETR**

<http://www.detr.gov.uk/>

[The Construction Industry Board](http://www.ciboard.org.uk)

<http://www.ciboard.org.uk>

**Rio+5**

<http://www.ecouncil.ac.cr/rio/earthsummit.htm>

**Foresight**

<http://www.foresight.gov.uk/default800.htm>

[Local Agenda 21 Steering Group](http://www.scream.co.uk/la21/sdu.html#1)

<http://www.scream.co.uk/la21/sdu.html#1>

[The Construction Industry Council and TOPIC](http://www.cic.org.uk/)

<http://www.cic.org.uk/>

[The Constructors' Liaison Group](http://www.clg.org.uk/)

<http://www.clg.org.uk/>

[The Construction Products Association](http://www.constprod.org.uk/)

<http://www.constprod.org.uk/>

[The Construction Clients' Forum](http://www.construction-clients.org.uk/)

<http://www.construction-clients.org.uk/>

[The dti Design Policy Unit](http://www.dti.gov.uk/design/sectiona.htm)

<http://www.dti.gov.uk/design/sectiona.htm>

**CRISP**

<http://www.crisp-uk.org.uk/>

[The UK Local Government Association](http://www.lga.gov.uk/)

<http://www.lga.gov.uk/>



# Appendix B EU/UK Government Education Initiatives

## B.1 EU Education and Training Programmes

<http://europa.eu.int/comm/education/socrates/adult/overview.html>

Several EU Education and Training Programmes and Actions completed their first phase at the start of 2000 and are now entering into their next phase. This new generation of EU Education and Training Programmes attach considerable to lifelong learning through the Leonardo da Vinci, Socrates and Grundtvig. Further information can be obtained from the Europa web site.

### B.1.1 Leonardo da Vinci

<http://europa.eu.int/comm/education/leonardo.html>

The Leonardo da Vinci Community Vocational Training Action Programme was first introduced in 1994. It is now in its second phase, which runs from 1st January 2000 to 31st December 2006. The programme *“supports innovative transnational initiatives for promoting the knowledge, aptitudes and skills necessary for successful integration into working life and the full exercise of citizenship, and affords scope for links with other Community initiatives - particularly the Socrates and Youth programmes - by supporting joint actions.”* The Council Decision of 26 April 1999 (OJ L146 of 11 June 1999) established the main direction of the second phase. The priorities for proposals, details of application procedures, application forms and annual deadlines for the submission can be obtained from the above web site.

### B.1.2 Socrates

<http://europa.eu.int/comm/education/socrates.html>

The main objectives of Socrates are to:

- build up a Europe of knowledge and thus promote a better response to the major changes of the century;
- to promote lifelong learning;
- encourage access to education for everybody and to help people acquire recognised qualifications and skills; and
- encourage mobility and innovation.

### B.1.3 Grundtvig

<http://europa.eu.int/comm/education/socrates/adult/home.html>

Grundtvig, *Adult education and other educational pathways*, is one of several actions within the Socrates programme and is aimed at enhancing the European dimension of lifelong learning. The Grundtvig action addresses wide range of activities designed to promote innovation and the improved availability, accessibility and quality of educational provision for adults, by means of European co-operation.

The action supports the following four types of activities.

**Grundtvig 1:** Transnational co-operation projects

**Grundtvig 2:** Learning partnerships

**Grundtvig 3:** Mobility for training of educational staff

**Grundtvig 4:** Networks

## B.2 The Learning and Skills Bill

<http://www.publications.parliament.uk/pa/ld199900/ldbills/014/2000014.htm>

The Learning and Skills Bill was launched by David Blunkett, the Education and Employment Secretary, in December 1999. The Bill implements the June 1999 white paper, *Learning to Succeed – a new framework for post 16 learning*. The Bill aims to transform post 16 learning and skills delivery, however, the Bill's scope has been restricted to the establishment of the Learning and Skills Council and related matters. Other consultation exercises relating the white paper related to school sixth form funding and establishing a new Youth Support Service and a new Small Business Service. Further details of the Bill can be obtained from the above web site.

## B.3 National Record of Achievement

The 1996 National Committee of Inquiry into Higher Education chaired by Lord Dearing was convinced that; *“it would be advantageous if institutions of higher education were to contribute to the use of a Progress File as part of a student's academic and personal development. The contents of the File would help students to review and record their past achievement, and encourage them to set targets and plan future development. It would provide a record from which they could construct their curricula vitae to communicate their achievements to prospective employers or education and training institutions.”* Following the Dearing Report, several projects have been funded to develop methods of recording achievement in Higher Education institutions and builds on the good practice from the current National Record of Achievement. Further details have been provided on the HE web site, which provides ready access to the main educational initiatives. The Progress File: Achievement Planner is an interactive ‘family’ of materials designed to assist individuals to plan and manage their own learning throughout their lives. It has been developed in response to the Dearing Report and has been designed for users to dip in and out of and customise to suit their individual needs, whether in education, training, or employment. Progress File materials are currently being tested by the DfEE through a series of Demonstration Projects to identify how it can benefit individuals and organisations in education, training and employment settings. Once evaluation is completed on the Demonstration Projects in 2001, Ministers will consider whether to introduce Progress File nationally. The Progress File web site contains the most up-to-date information on all Progress File developments, as well as background information, links to other DfEE web sites including the National Record of Achievement (NRA), and an opportunity to view Progress File materials.

# Appendix C Educational Networks

## C.1 Joint Information System Committee (JISC)

<http://www.jisc.ac.uk/>

The Joint Information System Committee (JISC) is funded by the higher and further education councils in partnership with the research councils. The mission of the JISC is: *"To stimulate and enable the cost effective exploitation of information systems and to provide a high quality national network infrastructure for the UK higher and further education and research councils communities"*. Some of the initiatives funded through JISC have been briefly described below along with the relevant web sites.

<http://www.tasi.ac.uk/>, <http://www.ilrt.bris.ac.uk/>

The Technical Advisory Service for Images (TASI), hosted at the Institute for Learning and Research Technology (ILRT) based at the University of Bristol, was established to advise and support the academic community on the digital creation, storage and delivery of digital image archives.

<http://www.eevl.ac.uk/>

The Edinburgh Engineering Virtual Library (EEVL), led by Heriot-Watt University Library, provides a number services, all of which are free. Its mission is to: *provide access to quality networked engineering resources and be the focal point for engineering information*.

## C.2 Learning and Teaching Support Networks

<http://www.ltsneng.ac.uk/>

<http://cebe.cf.ac.uk/>

<http://www.lts.ac.uk>

The UK's four Higher Education funding bodies have committed £30 million over five years to 24 dedicated LTSN Centres. The centres are intended to benefit the whole of Higher Education by promoting high quality learning and teaching by stimulating the sharing of innovation and good practice. The centres will act as virtual and real meeting places for academics, where they can exchange ideas, input, learn, form working relationships and contribute to the development of learning and teaching approaches. The Engineering Subject Centre, based in the Engineering Faculty at Loughborough University, has received funding worth £2.5 million over an initial five years. The Centre for Education in the Built Environment (CEBE), based at Cardiff University, was established in January 2000 to provide support in the built environment subjects of Architecture, Landscape, Town Planning, Building and Surveying. Further details from the above web sites.

## C.3 Recording Achievement

<http://www.rapid.lboro.ac.uk/>

The DfEE awarded six demonstration projects under the theme for Higher Education Development Projects for the period 1998 - 2000. The Recording Achievement for Professional and Individual Development (RAPID) demonstration project was awarded to The Department of Civil and Building Engineering, Loughborough University in collaboration with the Chartered Institute of Building (CIOB). The aim of the project was to *"develop a process to promote a culture that will enable and support students and graduates to monitor, build and reflect upon their own personal development... within the discipline of construction management, and in partnership with the Chartered Institute of Building (CIOB)"*.

## C.4 The Centre for Urban Technology (CUT)

<http://www.ncl.ac.uk/cut/>

The Centre for Urban Technology (CUT) is one of an emerging network of regional centres. They have just produced a Memorandum of Understanding which sets out their common objectives which are articulated to meet local needs. CUT is the North East England regional centre funded and set up by the University of Newcastle, The University of Northumbria, and Newcastle College (a higher education institution delivering building trade and technician courses). A team at CUT recently completed a document *Guidance to Graduates* funded by TOPIC.

## C.5 Royal Incorporation of Architects in Scotland

<http://www.rias.org.uk/>

The RIAS (Royal Incorporation of Architects in Scotland) Distance Learning Library provides a constantly updated library of over 500 videos, tape and audio-visual packages suitable for architects and other professionals working within the construction industry. It also provides a simple and cost effective route to useful, structured, in-house CPD and aims to enhance users' knowledge of professional issues and management techniques.

## C.6 Professional Institutions

The RIBA and ARB (Architects Registration Board) have a new draft Part 3 syllabus (post-graduate pre registration course and exam). They have also recently received the Stansfield-Smith report on Architectural Education and this is under consideration. Many other Professional Institutions are currently carrying out equally radical reviews of education and initial professional formation, for example, engineering institutions are introducing significant changes in the light of SARTOR.

## C.7 The National Organisation for Adult Learning

<http://www.niace.org.uk/>

The National Organisation for Adult Learning (NIACE) has two categories of membership: corporate (organisations); and individual (for teachers, support workers or others). It represents over 200 corporate members across a range of providers, policy makers and users of adult learning opportunities. It aims to *"promote the study and general advancement of adult continuing education"*. NIACE's strategic plan commits it to *"support an increase in the total numbers of adults engaged in formal and informal learning in England and Wales; and at the same time to take positive action to improve opportunities and widen access to learning opportunities for those communities under-represented in current provision."*

## C.8 Television Networks

<http://www.bbc.co.uk/education/home/>

Television broadcasters will play an increasing role in the educational process by providing important links through the important communication media of the Internet and television as illustrated at the above Internet address.

## C.9 Creativity in Engineering Education

<http://www.ijee.dit.ie/forum/forum1home.html>

The Creativity in Engineering Education web site is a forum, which explores creativity within engineering education and practice, how it may be fostered and assessed in learning programs. It aims to develop a framework for implementing and evaluating such programs.

# Rethinking Construction

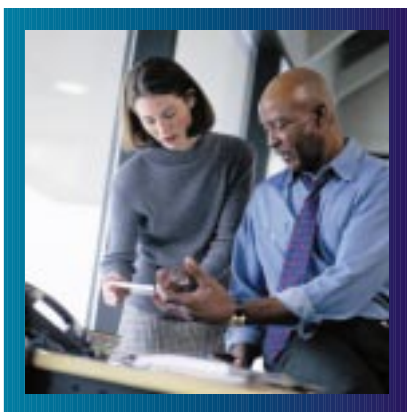
**Theme A: Product Development**



**Theme B: Production of Components**



**Theme C: Partnering the Supply Chain**



**Theme D: Project Implementation**





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