CRISP Consultancy Commission – 99/5

A review of current industry and research initiatives on design: final report

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Sebastian Macmillan
Eclipse Research Consultants
The Eden Centre
47 City Road
Cambridge
CB1 1DP

Summary

The overall aim of this commission is to identify and, where possible, categorise current construction research and construction industry initiatives that relate to design as a value generator. In practice, design is a difficult concept to use as an identifier for two reasons. First, because it can be used to refer to both a process and a product, and second because of the difficulty of drawing a useful boundary around it. In trying to define design, at one extreme it could be taken to encompass almost every aspect of construction that occurs from feasibility to commencement on site. On this definition, every research study undertaken which provides information that is of relevance to these stages of a building project would count as design research. This might include not only information about every component, every material and every technology, but also studies of buildings in use that could feed back into building design. Because of its lack of differentiation, such an all-inclusive use of the term is of little use in practice. At the opposite extreme, design could be defined in an exclusive way as the process of determining the three-dimensional spatial arrangement and visual appearance of a building, and differentiated from activities such as specifying, estimating and calculating. This exclusive definition would leave out a lot of research that in practice is relevant to the contributions made by members of a design team. Although a debate about definitions may seem unproductive, it is fundamental to this commission. Whether design is considered under-researched depends at least in part on how design is defined.

Section A presents various tabulations of recent construction research. When current research is mapped onto design-related issues from the Egan Agenda and the DETR (1998) Business Plans, many projects appear on the map and it would be difficult to claim that design is under-researched. However, what the Design Task Group identified as missing from among this research, and the area of their particular interest, was research into the added value produced by design, not just to the client but to wider stakeholders in the built environment.

Section B reviews publications that address design quality and value in buildings. It shows that research into the evaluation of design quality using explicit criteria (or indicators) has been undertaken at the urban design level rather than the individual building level. There is, however, some research on quality and value in housing and healthcare buildings. Certain building award schemes reveal, also through their explicit criteria, what qualities in buildings are valued by the organisations making the awards. The RIBA's recently published booklet on the value of architecture identifies the role that good design has had in a number of flagship schemes. Lord Rogers' recent report *Towards an Urban Renaissance* emphasises the importance of good design to the quality of urban life.

Design process research in that has addressed the achievement of quality and value is reviewed in Section C. It includes work by CIRIA, and academic research at the universities of Sheffield, Reading and Cambridge and elsewhere.

The overall conclusion from this commission is that *construction research* has had a strong focus on optimising the construction process – identifying needs, improving productivity, and reducing costs - all with the overall aim of better meeting the requirements of clients. Some of this research does relate to the contribution of design to the construction process. However, valuable though this research is, its focus remains limited when considered against the full range of concerns of designers of the built environment. It has not addressed the broader issues of the contribution of design to quality and value in the built environment. Here *urban design* research, *housing* research and *healthcare* research have begun to devise methods and approaches that could inform future construction research. Above all, a cross-disciplinary approach is needed to ensure that built environment research is more than simply a collection of unconnected sub-disciplines. Design is the one factor that links these sub-disciplines, and design research has the most to gain from joined-up thinking across the whole of the built environment.

1 Introduction: background and objectives to the study

The last five years has seen a substantial effort by government to review and improve the business processes of construction. It follows the achievements of DTI in the 1980s towards 're-engineering the business process' of manufacturing. In the mid-1990s, the Technology Foresight programme in the construction sector identified as a key opportunity the application of advanced business processes to construction, particularly attitude change, team building and development of an innovation culture. CRISP (the Construction Research and Innovation Strategy Panel) subsequently identified that human issues, specifically *motivation*, were vital if the benefits of research and innovation are to be realised in practice.

The Latham report *Constructing the Team* and subsequent Egan report *Rethinking Construction* are both part of this move towards improving the construction process. Both reports call for the replacement of confrontational and adversarial attitudes prevalent in construction with greater commitment to shared goals, effective teamwork and a focus on customer needs. The *Movement for Innovation* (M4I) was formed as a means to identify and collate demonstration projects embodying the principles put forward in *Rethinking Construction*. In late 1998, the DETR launched its Construction Best Practice Programme (CBPP), which aims to provide advice and assistance to construction industry organisations to improve their performance and competitiveness.

In parallel with these initiatives (and pre-dating the Egan Report) the Engineering and Physical Sciences Research Council set up its Innovative Manufacturing Initiative (IMI). IMI emphasised the need for research into business processes. Construction was fortunate to be included as a managed programme within IMI under the (highly significant) title *Construction as a Manufacturing Process* (CMP). EPSRC and DETR also jointly operate two LINK schemes closely related to CMP - *Integrated Design And Construction* (IDAC) and *Meeting Client Need through Standardisation* (MCNS). Between 1994 and 1999, EPSRC spent £9m on research into business processes in construction. The topics which have been studied include the 'process protocol' (though not yet widely known this is a potential successor to the RIBA Plan of Work), the briefing process, value for money, visualisation tools, design information flow, and communication and collaboration in the design and construction process. DETR also operates *Partners in Innovation* (formerly *Partners in Technology*), a research funding programme which supports construction and was launched in 1994.

In its recently published Strategic Priorities document CRISP, the Construction Research and Innovation Strategy Panel, suggests that *design* has received relatively little attention in these research and industry initiatives. In mid-1999 a CRISP Design Task Group was formed under the chairmanship of Giles Oliver and this paper was commissioned to inform the members of the Task Group about available research in design. The purpose of the paper was to identify and, where possible, categorise academic research and industry initiatives relating to construction design as a value generator and its implications for the construction supply chain. CRISP specified that it was interested in initiatives "which relate to end user needs" and "to optimising the construction process."

This was the starting point for the paper. But in practice the early meetings of the Design Task Group were broader in scope than implied by the initial brief. Rather than focusing on research which contributed to "optimising the construction process" or "relating to end user needs", the Task Group's deliberations ranged over a wide canvas. The paper was developed in parallel with, and partly in response to, the Task Group's early meetings, and it is therefore presented in three sections

- Section A: Current construction research on 'design'
- Section B: Quality and value in design – evaluating buildings and urban designs
- Section C: Achieving quality and value - process issues

Section A: Current construction research on 'design'

A.1 The UMIST construction research database

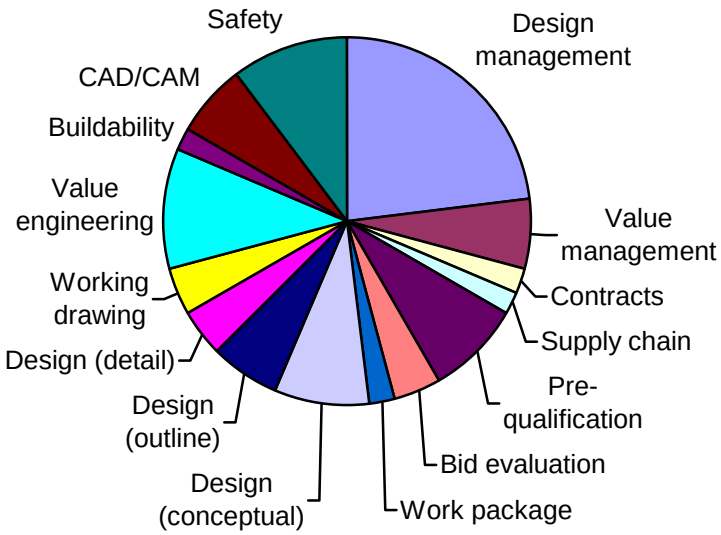
In 1997 DETR commissioned UMIST to construct a database of construction research. It is available on line at www.ba.umist.ac.uk/crmp. The contents are classified according to the process map devised by BAA and the University of Salford. The following table is based on the UMIST database entries and reproduces from the database the process map and the number of entries under each heading. The database was last updated in February 1999.

	Process management				Project realisation							
	Business strategy	Pre-feasibility	Project definition feasibility	Scheme definition	Detailed design	Work packing	Manufacture	Logistics	Install/ Construct	Testing Commissioning Start-up	Operating Maint'ce	Decomm Feedback
Develop't	26	4	3									
Planning			3	12	10	9		1	4			
Design management		7	12	17	17	11	12		5			
Procurement		4	11	21	9	11	7		8			
Construction						9	13	7	17	1		
Control and monitoring			5	5	9	5	5	5	17	5		
Facilities management										1	1	
Project management		69	70	80	79	79	71	72	66	10		7

TABLE 1

In the paper reporting the database, also on the web site, the authors present as their Exhibit 7, a pie chart classifying 51 entries dealing with design management (re-created below).

UMIST Exhibit 7 - entries dealing with design management



The UMIST authors state: "Of all the functions, ***Design Management*** shows the broadest coverage with entries in all but one process stage. Frankly this was somewhat surprising to the research team: we had thought that design was a relatively under researched topic." However, a detailed check of every design-related entry in the database shows that their initial impression about design being under-researched was the more correct. Only two items in the database deal in any depth with the construction design process. These are:

- Salford University's LINK IDAC 88 project on *Managing the brief as a process of innovation*
- Loughborough University's LINK IDAC 100 *Design information management*.

A.2 Davis Langdon Consultancy mapping of research projects in relation to the Egan Agenda.

DLC have mapped BRE framework projects, LINK MCNS projects, LINK IDAC projects and current PIT projects against the issues raised in the Egan Agenda in their *Report on relation of current research to 'Rethinking Construction'* (May, 1999). In the following table, the parts of their mapping exercise that they relate to design have been extracted.

	Design related issues from 'Rethinking Construction'							
	Production of components: detailed engineering design	More and better training: designers	Integrating design and construction	Involving suppliers and subcontractors in the design process	Feeding experience of one job into the next	Designers working in collaboration with other participants	Designing on the basis of whole life costs	Clients accepting their responsibilities for design
BRE: Demonstrating improvement in procurement				2				
BRE: Value management techniques				1		2	1	
BRE: Post project building appraisal					2			
BRE: Innovative application of prefabrication techniques			1	1				
BRE: Standardised wiring systems							1	
LINK MCNS: Standardisation of window cladding interface			1			1	1	
LINK MCNS: Bldg Services standard solutions in CAD	1		1					
LINK MCNS: Standardisation in brick construction			1					
LINK IDAC 11: Clients Project Definition Tool								2
LINK IDAC 82: Development of decision making tools			1					
LINK IDAC 88: Managing brief as a process of innovation								1
LINK IDAC 100: Design methodology and tools		1	1					
LINK IDAC 229: Building a high value construction environment								
LINK IDAC 243: Re-engineering process for steel structures			2	1		1		
LINK IDAC 310: Achieving quality through interdisciplinary teamwork in design								
LINK IDAC 435: integrated collaborative design			1	2			2	
LINK IDAC 532: IT tools for support of briefing								
LINK IDAC 575: Measuring effectiveness of teamwork			2	2			2	
PIT/BSRIA: Technical reports to CQF					1	1		
PIT/BSRIA: Mechanism for feedback to M&E design					2			
PIT/BSRIA Clients guide to defining building services								2
PIT/CIRIA: Optimised use of SPM		1						
PIT/CIRIA: CDM regs guidance		2						
PIT/CIRIA: Change management manual		1						

PIT/CIRIA Faster construction times			1		1	1		
PIT SCI: Optimising steel const through VE				1		1	1	
PIT/SCI: Design guide, residential framing	1							
PIT/SCI: Risk assessment in CDM regulations		1				1		
PIT/BRE: Coord Project Information			1	1	1	1	1	1
PIT/BRE: National standards details library			1	1	1	1	1	1
PIT/BRE: Promoting innovation – the role of FM					1	1	2	
PIT/BRE: Construction Quality Forum		1	1	1	1	1	1	1
PIT: Methods/tools for partnering				1				
PIT: Safer steel erection			1	1	1			
PIT: Good repair guides				1	1			
PIT: Construction supply network			1	1	1	2	2	2
PIT: Managing geotechnical risk								1
PIT: Whole life costing for building services							2	
PIT: Revise commissioning code C								
PIT: whole life costing for clients/design						1	2	1
PII: BSRIA Business focused on op'n/maint guides							1	
PII/BSRIA Design for just sufficient performance							1	1
PII/BSRIA: Feedback from facilities management					2			
PII/CIRIA End user FM manual							1	
PII/BRE: Toolkit to measure functional performance					2			1
PII/General: Risks in hydraulic design					1			
PII/General: Whole life costs in port etc engineering							2	

TABLE 2 Note in the table above 1 = indirectly addressed, 2 = directly addressed.

Visual inspection of all the matrices in the DLC report suggests that design is quite a well covered area – certainly there seems to be as much coverage of it as of any of the other areas tabulated.

A.3 DLC's *Construction Research 1998-1999 Management Report*

DLC's report of July 1999 maps PIT and LINK projects against the key priorities in the 1998 DETR Construction Process Business Plan. Under the heading *Design Process*, the report lists four sub-areas, and under each of the sub-areas, the following projects:

Integrating design and construction	**Greater involvement of the supply chain in the design process**	**Standardisation, pre-assembly, modularisation**	**Improving buildability**
IDAC 82 Decision making tools	Demonstrate improvement in construction procurement	Demo improvement in construction procurement	Steel detailing guide for architects
IDAC 243 Re-engineering	Integrated collaborative design	Innovative application of prefabricated construction techniques	Optimising costs of steel construction through VE
IDAC 435 Integrated collaborative design	Role of specialist building services contractors in procurement	Standardisation of window and cladding interfaces	Standardisation of window and cladding interfaces
Construction supply network	Construction supply network	Standardisation and skills: training skills for prefabrication in housing	Development of decision making tools for controlled innovation in construction
Standardisation of window and cladding interfaces	Standardisation of window and cladding interfaces	Innovation in standardised component systems in housing	Innovative assembly of precast concrete components
IDAC 100 Design information methodology	Forging new supply chain partnerships sourcing in construction	Building services standard solutions implement in CAD	Overcoming the barriers to standardised wiring systems

IDAC 575 Measuring the effectiveness of interdisciplinary teamwork	IDAC 575 Measuring the effectiveness of interdisciplinary teamwork	Standardisation in brickwork construction	
Construction quality forum	Mechanisms for feedback to designers on building services installations	Adding value through standardisation and pre-assembly	
Technical reports to the CQF	Construction Quality Forum	Optimised use of standardisation, pre-assembly and modularisation	
Optimising costs of steel construction through VE	Technical reports to the CQF	Factory prefabrication and construction	
	Optimising costs of steel construction through VE	Performance specification for preengineered modular steel construction	
		Benefits of standardisation in steel design and prefabrication	
		Design guide on modular construction using light steel framing	
		Rationalisation in standardised construction	
		Innovative assembly of pre-cast components	
		Overcoming the barriers to standardised wiring systems	
		Demo of clients toolbox for standardisation	
		Improving timber design codes and building efficiency	

TABLE 3

As with the previous DLC report, the number of entries suggests that design is a well-researched area, a view shared by the report authors. They argue that three of the four sub-areas (integrating design and construction, involvement of the supply chain in the design process, and improving buildability) should continue to be supported, while research projects in standardisation should be reviewed for gaps and an impact assessment undertaken of past work.

A.5 RIBA research database

The RIBA database of architecture was commissioned from BSRIA by the RIBA Research & Innovation Committee in 1995 and completed in 1996. It is being turned into a web-based database and will be launched on the RIBA's website in late 1999. Updating will be by the authors of entries themselves. Currently it contains about 400 entries, ranging from social science based studies to technical research. It includes projects funded by the RIBA through their Trust Awards scheme. It has a free searching facility, and using the key word 'design' generated 75 entries. Inspection of each of these revealed that 13 were about design processes:

BSRIA/PIT 1995	Mechanisms for feedback to designers of building services installations
BSRIA/PIT	Benchmark costs as targets
BSRIA	Building services project management guide
Prof. C Davies, Welsh School of Architecture, funded by HEFCW	The design and management of buildings for efficient use, with special reference to health care buildings
A J Stevens, BRE	Buildability in multi-material construction [dimensional accuracies]
D Bloomfield, BRE, 1995	Application of IT to building design
N Baker, Martin Centre,	Daylighting design of European buildings

Cambridge	
Department of Construction Management, University of Reading, EPSRC funded	Management of communication of technical information
Norman Fisher, Department of Construction Management, University of Reading, EPSRC funded	The development of a concurrent engineering design tool for construction
Colin Gray, Department of Construction Management, University of Reading	The development of process models to identify delay in construction operations
Department of Construction Management, University of Reading	The application of knowledge based engineering to heating and ventilating engineering design
Norman Fisher, Department of Construction Management, University of Reading, LINK IDAC	A clients project definition tool
Norman Fisher, Department of Construction Management, University of Reading, BAA funded	Benchmarking in the construction industry

TABLE 4

A.6 Partners in Technology pre-1998

DLC's analyses in sections A3 and A4 cover primarily the period when they have had management responsibilities. The following tables list research funded under PIT from the period 1995-1997 that addresses design.

PIT 1995

Proposer	**Title**
BRE	Risk management for construction
Ritter	Risk management and quality systems in building design
BRE	Evaluation of secured by design in public sector housing
CIRIA	Improving access to information by construction professionals – guidance document
BRE	Quality in design and build construction
W S Atkins	A study into the process of concurrent building design
TRADA	Survey of the impact of ISO 9000:1994 in the construction industry
TRADA	Integrating design, manufacture and construction: opportunities for technology transfer
UCL	Strategy for increasing innovation culture of the construction industry
BRE	Building information warehouse
Cyril Sweett	Improved reliability in construction cost prediction through integration
CIRIA	IT: the management of integrated project databases
CIRIA	Partnering for improved project results
BSRIA	Technical reports for the CQF
SCI	Development of knowledge based rules for steel
BRE	Assessment of feasibility stage of building projects to identify best practice
Battle McCarthy	Engineering simulation as a design tool for architects
AQP	Innovation in building

TABLE 6

PIT 1996 (split by business plan)

The Motivation Business Unit

Organisation	Title
Construction industry Council	Tracking the changing workload of construction professionals
British Cement Association	Targeted technology transfer in construction
Building Centre Trust	Development of case studies on the application of IT in construction SMEs
Construction industry Council	Integrating to innovate
University of Dundee	Technology transfer programme for the use of PFA to BSEN450 in structural concrete
University of Glamorgan	Innovation champions: an investigation into their leadership styles & how they create teamworking & change attitudes
Loughborough University	Measurement of IT innovation benefits

TABLE 7

The Environment Business Unit

Organisation	Title
University College London	Stack ventilation & cooling for urban sites
CIBSE	Revised CIBSE guidance note for CFCs, HCFCs & halons
British Cement Association	Recycling by re-using concrete buildings for the 21st century
Building Research Establishment	Precast structural units using re-cycled concrete
Strategic Business Solutions	Improving productivity in offices
Building Research Establishment	Overcoming conflicts between natural ventilation & fire safety in atrium-type offices
Building Services Journal	PROBE 2 - post-occupancy review of building engineering
CIBSE	Revision of Section A1 of the CIBSE Guide

TABLE 8

The Process Business Unit

Organisation	Title
CIRIA	A modern building design management manual for construction
TRADA Technology	Re-engineering timberframe: a demonstration project
Whitbread	Process rationalisation in standardised construction
J B Dalton	RIBA QA toolkit
CIBSE	A clients guide to technical risk

TABLE 9

The Safety and Health Business Unit

Organisation	Title
WIMTEC Environmental	Passive stack ventilation for acoustically treated dwellings
Building Research Establishment	Sound transmission across solid concrete blockwork separating walls

TABLE 10

PIT 1997 (split by business plan)

The Environment Business Unit

Proposer	Title
A B Birtles	Effectiveness of Design Specifications in BREEAM

Proposer	Title
GAIA	The Green Architects Job Book

TABLE 11

The Motivation Business Unit

Proposer	Title
BSRIA	Best Practice clubs for innovative strategies in building services
Construction Industry Council	Benchmarking for SME's in the Construction Consultancy Sector
CIRIA	Promotion of the benefits of innovation - Practitioner reviewed case studies
University of Salford	Standardised Process Improvement for Construction Enterprises (SPICE)

TABLE 12

The Construction Process and Commercial Framework Business Unit

Proposer	Title
Alfred McAlpine	Demonstration of the Process Protocol
BRE	IQIT: improving quality through integrated IT
BRE	The construction quality forum
BRE	Role of specialist building services contractors in the procurement process
BRE	Promoting innovation in construction - the role of facilities management
BRE	A case for IT best practice - parameters affecting benefits of IT in construction projects
BSRIA	Uptake of productivity improvements
BSRIA	Technical design quality assurance for building services
Construction Clients' Forum	Whole life costing guidance for clients & designers
Construction Industry Council	The role of cost savings & innovation in PFI projects
CIRIA	Best practice Change management manual for construction information
CIRIA	Standard risk register for the construction supply chain
David Bartholemew Associates	Knowledge management in building design practices
Davis Langdon Consultancy	Value by negotiation - the application of benefit-trading to the construction supply chain
Galliford plc	Integrated information exchange for improved water industry
Halcrow Gilbert Associates Ltd	Guidelines for successful building handover
Steel Construction Institute	Design guide for residential framing
Steel Construction Institute	Optimising costs of steel construction through value engineering
Warwick Manufacturing Group	Supply Chain Management - Understanding, Improving
W S Atkins	Whole life costing techniques applied to building environmental services

TABLE 13

A.7 Building performance – the PROBE studies

Construction research on the whole has very little to say about the quality of the designed product. However, the PROBE studies are worth reporting because they represent a major piece of research into the performance of buildings.

Between 1995 to 1998, the Probe project (Post-occupancy Review Of Buildings and their Engineering) undertook and individually published surveys of sixteen recently-completed buildings (seven office buildings, five educational buildings, and four other buildings), together with a range of introductory and overview reports. Probe was jointly funded by Building Services Journal (BSJ) and DETR under PIT, and carried out by William Bordass Associates and Halcrow Gilbert.

The studies revealed progress on a number of fronts, for example:

- Good occupant satisfaction in some deep-plan air-conditioned buildings, owing to improvements in design and particularly management.
- Mixed mode buildings (which combine natural with mechanical ventilation and cooling), with significantly lower energy use than their air-conditioned counterparts.
- Innovative naturally-ventilated buildings with low electricity consumption.

Probe also confirmed the pervasiveness of some persistent problems, including:

- Unnecessarily high energy consumption, particularly in the air conditioned buildings and areas; exacerbated by excessive levels of ventilation, humidification and plant operation. Intrinsically efficient solutions should be seen as essential features, not added costs. Clearer benchmarking in design and use is also needed; taking into account the full range of end-uses.
- High levels of air infiltration. Pressure tests showed that only two of the eight buildings in Probe 2 met reasonable standards (and motorised openings for automated natural ventilation could themselves be very leaky). A lack of controlled airtightness not only wastes energy directly but causes poor comfort and additional plant running hours. It also undermines the benefits of good insulation and requires plant to be routinely oversized.
- Little energy management activity, even in otherwise well-managed buildings and in those for which energy efficiency had figured prominently in the brief.
- Often too much complication, leading to technical problems, unintended consequences, and difficulties for management. “Keep it simple and do it well” is a strong message.
- Poor functionality, usability and manageability of controls, both manual (e.g. windows) and automatic. This often increased energy use, particularly by systems defaulting to ON. It also reduced comfort - particularly in buildings with automated control of natural ventilation: these buildings are innovative, and need care. But in these and other buildings there was usually:
- Little or no provision for monitoring and fine-tuning systems after occupancy; where indeed effective action could also be contractually constrained during the Defects Liability Period.
- Outsourced contractors (and presumably the contracts they were working to) also seemed to be more likely to maintain the status quo than to question and improve it.

The best results were found to come from combinations of technical and management measures. The best example of combining comfort and energy efficiency was the Elizabeth Fry Building, where a committed client and a design team which had worked with them before were able to make thoughtful and responsible innovations, to take advice where necessary, and to deliver - via a committed contractor - an attractive, comfortable and energy-efficient building at normal cost levels. However, even this building needed careful monitoring and fine-tuning before all the performance benefits could be delivered. With this knowledge, the designers considered that they could reduce energy consumption still further next time, particularly for lighting & mechanical ventilation.

A.8 Design studies – generic or specific?

Design as a term is used to describe both a process and a product. In the classifications in sections A2 to A6 the word design has been interpreted inclusively to refer to almost any research project which relates to activities having an impact on the construction design process or the design product. A less inclusive use of the word

might result in many of the research projects listed in A2 to A6 being excluded. For example, the research project *Design Guide for Residential Framing* includes the word design, but neither focuses on the activity of designing or on generic issues about design products. From the project titles, many other research projects that have been listed focus on particularly technologies and do not examine generic issues about design.

It is also apparent from the listings that almost all the projects focus on specific techniques (value management) or technologies (steel, framework) or issues (risk, whole life costing). In this sense none of the studies addresses generic issues about design. In particular, there is very little research into the added value that designers bring to a project. Relatedly there is very little about design quality and how to achieve it and measure it.

Another gap that can be identified is in relation to the effects of buildings. There is a strong emphasis, relating to the Egan Agenda, on meeting [paying] clients' needs. But buildings have a far wider impact that this. First there are the users of buildings who are not necessarily the same as the paying client, yet on whom a building can have substantial effect in terms of health, welfare and productivity. Second much more broadly is the effect on people and society. Buildings are very public design products whose impact is large in visual terms and which can have effects as diverse as on microclimate, on land values, on transport needs, and so on. Research into these sorts of effects is largely missing from *construction research*.

In summary, although there is an extensive UK portfolio of construction research, there is very little on:

- Issues of quality and value in design
- Broader impacts of buildings beyond meeting clients' needs.

These areas are discussed in section B.

Section B: Quality and value in design – evaluating buildings and urban designs

B.1 Quality and value in building

Concerns about quality and value in building design are not new. They can be traced back at least as far as the Vitruvian principles of 'firmness, commodity and delight'. However, as shown in Section A, typically *construction research* has not addressed these kinds of issues at the generic level. There is an exception to this - shortly before retiring Maurice Burt, Deputy Director of the BRE wrote *A survey of quality and value in building* (BRE, 1978). The terms of reference of the study were:

- To establish criteria for quality, performance and costs and, so far as possible, to show how these criteria can be evaluated against each other
- To consider the procedures which have significant influence on value for money and to make recommendations for improvement.

Burt argued: "Quality and value depend on the skill and experience of all participants in the process, the adequacy of information and techniques available to them and the effectiveness of the communication between them." Later he states: "Criteria for quality and value are available or could be developed for many attributes, but their derivation for other attributes and the weighting of their relative importance present substantial

problems. Many procedures affect quality and value. There are both scope and need for improvement in criteria and procedures, and therefore numerous opportunities for research and development."

Burt defined quality as follows:

"In this paper, quality is defined as the totality of the attributes of a building which enable it to satisfy needs, including the way in which individual attributes are related, balanced, and integrated in the whole building and its surroundings. The following grouping and definitions are used:

1. External attributes [relating to the site and the effects of the building on its surroundings, transport facilities and generation of traffic, accessibility, effects on services like drainage, appearance, overshadowing and privacy, safety control of noise and vibration, etc.]
2. Performance [attributes mainly relating to the interior of the building which makes it operationally efficient: accommodation, size, general layout of spaces, equipment, environment, lighting, thermal comfort, air purity, protection against effects of weather, energy conservation, structural stability, avoidance of risks from fire and from intruders, cleaning, maintenability, reliability, flexibility, adaptability, longevity.]
3. Aesthetics and amenity [internal and external attributes, external appearance and related landscape, standards of comfort, convenience, and visual attraction, amenity, contribution to business competitiveness, improvements in staff or public relations.]

"The designer has to integrate the operational, mandatory and amenity requirements into a total design. In doing this he seeks a balance between various attributes and assesses alternative ways of achieving them. … Thus to the extent that time and information allow, and within the accuracy of the cost estimates, the designer does evaluate one attribute against another in the search for an optimum solution."

Burt made various recommendations for research including:

"(a) Clarification of the interaction between building design and operational efficiency for various building uses; and investigation of the scope for designing or adapting buildings for multiple or alternative uses.

(b) Provision of information, methods and criteria to guide the client and designer in their value judgments during the critical period of brief preparation and layout design.

And he said "Attention should also be directed to the difficult problems of assessing aesthetics and amenity, and incorporating them in some overall assessment of quality and value."

B.2 Urban design quality

It has not been possible to trace what happened as a follow up to Burt's research recommendations. It was almost 20 years later in June 1995 when the Department of the Environment launched its *Quality in Town and County: urban design campaign*. This did not define quality, but the section on Urban Design includes the following:

> "Quality in Town and County placed new and particular emphasis on the importance of good urban design. The quality of individual buildings is also a vital concern, but local character consists of more than just the sum of individual buildings. The pattern of streets and public spaces, for example, is itself a defining element of local character. …There is no single common definition of urban design. … But it may be taken to mean the relationships between different buildings; the relationship between buildings and the streets, squares, parks and other open spaces which make up the public domain; the relationship of one part of a village, town or city with other parts; and the interplay between our evolving environment of buildings and the values, expectations and

> resources of people; in short, the complex inter-relationships between all the various elements of built and unbuilt space, and those responsible for them. … Attention to urban design means identifying and having regard to the characteristics of the wider local area whenever changes are required and made. It means understanding and acknowledging existing context before seeking to create anew."

A year earlier, in 1994, the Royal Fine Art Commission published its enquiry into *What makes a good building?* This argued:

> "Architecture is a visual art in that it can only be fully understood and appreciated through the eye. Judging buildings or designs of buildings is largely a matter for the eye. An informed eye knows which is a good building. By an informed eye is meant an eye which can read the plan and section of a building and which, in looking at a completed building can understand its organisation, function and construction. An informed eye also means and eye which can appreciate purely aesthetic qualities of scale, composition, silhouette, proportion, rhythm and how the building fits into its surroundings."
> "It is possible to be objective about quality, taste on the other hand remains subjective. What makes a good building is quite simply a good brief, a good client and a good architect – in other words enlightened architectural patronage…And great effort and passionate commitment."

The following six criteria for good building were put forward:

Order and unity	The search for order – balance, repetition, the grid, the bay the frame
Expression	Apt expression of the function of the building, which enables us to recognise the building for what it is.
Integrity	Integrity or honesty – strict adherence to principles of design
Plan and section	The building as a whole, not just its elevations but plan and section
Detail	Detail or ornament and whether intrinsic or added
Integration	Harmony with neighbouring buildings, in terms of siting, massing scale, proportion, rhythm and materials.

TABLE 14

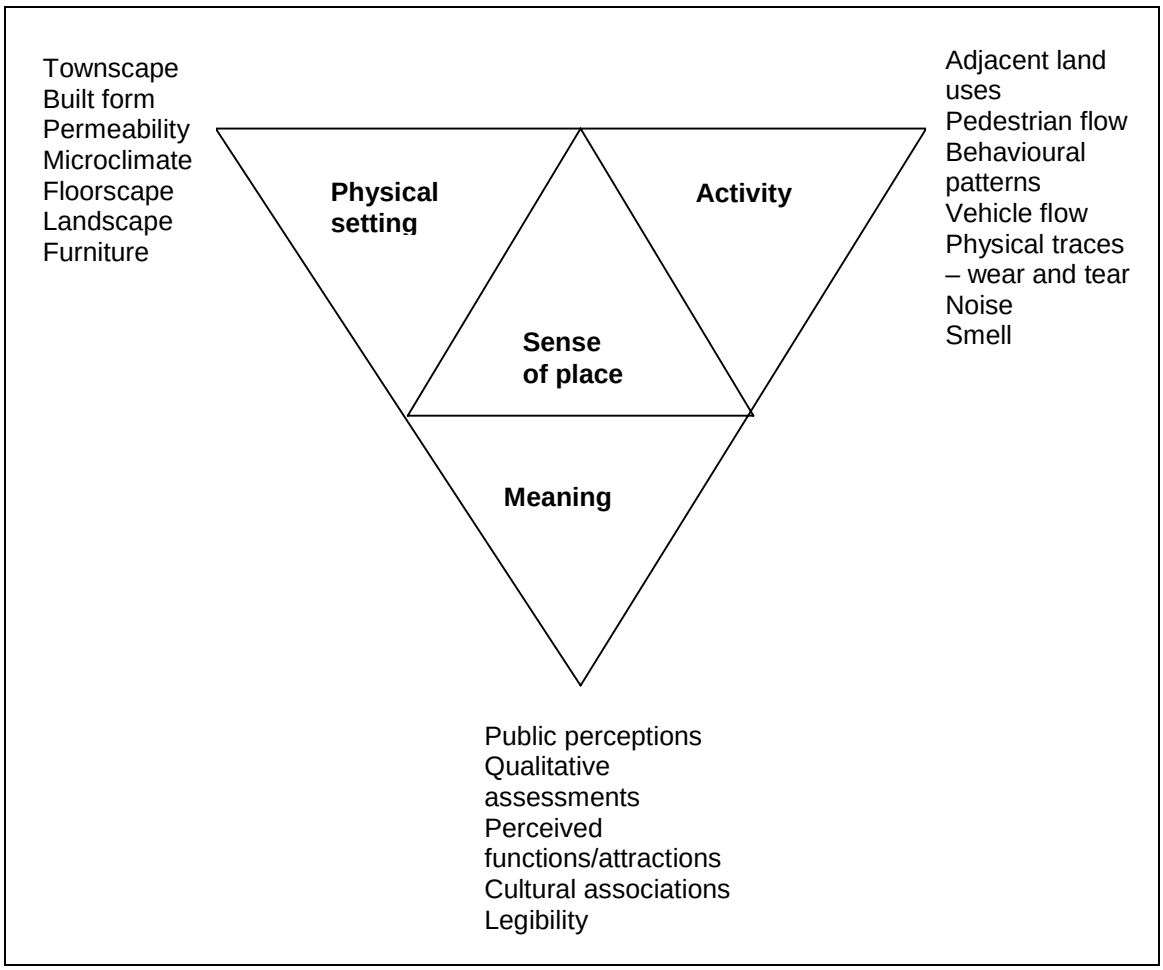
There is a long review of issues of design quality in *The Design Dimension of Planning: theory, content and best practice for design policies*, by John Punter and Matthew Carmona, (E&FN Spon, 1997). Their chapter 4 discusses *The fundamentals of design: substantive and procedural theory as a basis for policy*. They review how design has been interpreted in planning legislation, discuss aesthetics and design, and address social concerns and urban design. The authors also review briefly the literature on the concept of 'place' and also the research on environmental cognition (how people acquire and represent spatial information) and environmental assessment (how people describe and evaluate their surroundings).

Punter and Carmona cite a table comparing Maslow's hierarchy of human needs and how they might relate to some design considerations:

Maslow's hierarchy of human needs	Some design considerations
Physiological Food, shelter, health	• Adequate accommodation, utilities, and services • Comfort • Ecologically sound and stable
Safety and security Protection from danger, pollution, privacy	• Road safety • Surveillance • Privacy • Accessibility/permeability/robustness
Affiliation Belonging, community	• Community facilities • Sense of identity, place • Legibility, visual appropriateness
Esteem Status and recognition	• Ownership • Individuality, belonging
Self-actualisation Creativity	• Opportunities for personalisation and participation in design • Variety
Cognitive, aesthetic Intellectual and sensual stimulation	• Cultural/recreational opportunities • Quality townscape and landscape richness

TABLE 15

The authors cite the following diagram to summarise the main components of 'a sense of place'.



In another table, the authors compare and contrast the principles of the Prince of Wales (his *Ten Commandments of Architecture and Design*) with other checklists from publications by Kevin Lynch, Jane Jacobs, Bentley and others from Oxford Brookes University, Tibbalds, Holyoak, Urban Design Group, Wates, and Buchanan.

Elsewhere, the authors start with ten principles from Bentley et al's Responsive Environments publication and plot their implications for architecture, townscape, urban form, the public realm and landscape.

Above all the authors suggest that there has been a shift from a focus on design as 'external appearance' to a concern with the public realm and public space, and on to a concern with the public perceptions and experience of buildings and spaces. They draw attention to visual, functional and symbolic qualities of urban design. They also note to the ecological dimension, the relationship between the built and natural environments, and the notion of sustainable development. Chapter 4 concludes with a set of recommendations to guide policy development.

Chapter 8 deals with architecture. It starts with Vitruvius' principles of firmness, commodity and delight, but goes on to create a table comparing and contrasting what it calls 'principles for architectural control' which draws on Geoffrey Scott's *The Architecture of Humanism*, the RFAC's *What makes a good building*, a study by Peter Buchanan of contemporary windows in London, and the *Responsive Environments* study by Bentley et al from Oxford Brookes University.

Architectural traditions (after Scott)	RFAC criteria	Buchanan's criteria	Urban design principles, Bentley et al	Recommendations for architectural policy
Contextualism	Integration Siting, massing, scale, proportion, rhythm, materials	Acknowledge conventions, enter into a dialogue with the street	Visual appropriateness Scale	Relate to context Human scale
Mechanical	Expression - recognition of function Integrity – articulate structure	Express construction Substantial, tactile materials	Legibility Richness	Express use Express structure Use appropriate materials
Romantic	Detail – ornament and decoration	Decoration that delights – articulation of the wall	Richness	Rich and visually interesting architecture
Aesthetic	Order, unity – intelligible frame	Rhythm and repose Mass and materiality		
Ethical	All criteria	Search for a contemporary language	Richness – enriching heritage	Encourage contemporary architecture
Social purpose	Plan and section – nature of enclosed space	Create a sense of place Mediate public and private Windows to frame life Make outdoor rooms	Permeability (robustness, richness)	Reinforce the public realm
Ecological			Ecological Personalisation	Encourage sustainable architecture Allow some minority expression and personalisation

TABLE 16

In 'Making a city; urbanity, vitality and urban design', (*Journal of Urban Design*, vol 3, no 1, 1998) John Montgomery reviews the literature on 'a sense of place' and the imagery of the city. He cites a table of indicators of successful urban places taken from an earlier author. He suggests a list of 25 principles grouped into three main categories: activity, image and form. Under form, he identifies the following conditions as necessary to making a city:

1. Development intensity: high density of development leading to diversity and variety
2. Mixed use: a mixture of primary uses that attract people and encourage diversity
3. Fine grain: in particular the presence of small enterprises
4. Adaptability: achieved by the availability of buildings of various forms offering a mixture of room sizes
5. Human scale: as measured by building heights, street widths, and the number of intersections per square mile
6. City blocks and permeability: short city blocks and a street pattern with alleys and other shortcuts
7. Streets: contact, visibility, and horizontal grain: streets that encourage contact
8. Public realm: attention needs to be paid to outdoor rooms, civic spaces, quiet gardens
9. Movement: car travel must be accommodated but not allowed to dominate
10. Green space and water space: for recreation and health
11. Landmarks, visual stimulation and attention to detail: to increase legibility
12. Architectural style as image: to convey meaning and shape identity

In 'Private property decision makers and the quality of urban design', (*Journal of Urban Design*, vol 3 no 2, 1998) Alan Rowley reports the results of a research study funded

by the DETR and RICS (called *Quality of urban design: a study of the involvement of private property decision-makers in urban design*: October 1996) and carried out by the Department of Land Management and Development, University of Reading and DEGW. It addresses the involvement of developers, investors and occupiers in urban design. It examines the role and importance of urban design considerations, the benefits of giving explicit attention to urban design considerations, the factors which constrain the promotion of good urban design, and the incentives and other measures that might encourage increased attention and contribution to urban design quality. The original report followed on from the 1994 *Quality in Town and Country* initiative by the Department of Environment. Noting the difficulty of defining and discussing urban design quality, the researchers set out a list of 50 urban design considerations, grouped into four bundles:

1. Functional and social use considerations
2. Natural environment and sustainability considerations
3. Visual considerations
4. The urban experience

Each of five developments were rated against all fifty criteria on a scale of 0 to 4. The assessment was based on a number of sources including visits to each development by the two 'professionally qualified designers' in the research team, comments by other team members, and interviews with developers, investors, commercial occupiers and residents. The researchers admit a number of methodological limitations to the study (ranging from ambiguity, overlap and contradictions between the 50 considerations, to lack of input from local people, lack of quantitative assessment where considerations might allow, and so on) but nevertheless are able to claim that of the five case studies, Brindleyplace came closest to achieving a high standard of urban design when assessed by this process. *[This approach may be compared with the Housing Indicators reviewed below where the idea of a profile is emphasised, rather than aggregating the separate evaluations into a single score.]*

The author notes that although all the property people involved in the research incorporated urban design considerations into their decision making, they different in the range and nature of the considerations, the weight they attached to each consideration and the importance they attached to the quality of urban design relative to other priorities. The 50 considerations are not all equally relevant to all types of development and location. Different weights to different considerations may be required for different types of development and locations. The research also found that some players attached more importance to urban design than others and some drew on a wider range of urban design considerations than others.

The author reports that "While it is easy to cost a development, it is much more difficult to place a value on what are often intangible qualities, all the more so if a particular solution is innovative. So developers are frequently driven back onto a 'gut feeling' although a few claim to be able to measure the returns on investment in design quality. For this reason, persuasive architects and masterplanners can have a significant influence on property developers, helping to convince them of the added value better design may realize even if this involves an increased cost initially."

In conclusion, the author says that the relationship between urban design and planning is well established and comprehended, and has been the subject of considerable research, but that by contrast, the relationship between urban design, the development process and the property industry are poorly understood, rarely researched and rarely written about. His final line is that until this situation is remedied, most private-property decision-makers will still fail to appreciate the extent to which they can profit from investing in quality of urban design.

The Urban Task Force Report *Towards an Urban Renaissance* (E&FN Spon, 1999) states repeatedly that the initiative is to be design led and focuses on the importance of good design:

"Our analysis of successful urban design case studies emphasises how deeply quality of urban life is affected by good design."

It proposes the following key principles of urban design:

1. Site and setting
2. Context, scale and character
3. Public realm
4. Access and permeability
5. Optimising land use and density
6. Mixing activities
7. Mixing tenures
8. Building to last
9. Sustainable buildings
10. Environmental responsibility.

It goes on to suggest that a major commitment is required to implement a new framework for quality urban design, to ensure that the ten core principles are translated at a national and local level. And it proposes a 'spatial masterplan' that goes beyond conventional two-dimensional zoning plans.

Two other sources that discuss urban design quality are:

- *Planning for urban quality: urban design in towns and cities* by Michael Parfect and Gordon Power, Routledge, 1997
- Theory and practice in urban design, by David Owers and others, *Built Environment*, vol 22 no 4 page 253-322.

B.3 Town planning and design guidance

It was reported in Building Design on 22 January 1999 that 'Good practice guidance on design' in the planning system was being prepared, and in on 20 May 1999 the Architect's Journal stated that a report on *Urban design: principles, policy and practice* was being finalised. However, on 3 September 1999 Building Design reported that DETR was being criticised for inertia for failing to publish guidance for Local Authorities called *Design in the planning system*, which gives guidance on good design in housing.

Meanwhile, the Planning Officers Society published *Planning and Design: achieving good design through the planning process, a best practice note* (June 1999). The preface said that "I firmly believe that the public judges us by the design of our towns and villages, and also that planning authorities can do so much to improve things. … Design is about the way places function and the care with which we plan them."

There is a strong emphasis on design:

> "Good design is fundamental to good planning. … The emphasis on good design is central to national planning policy as set out by the Government in recent Planning Policy Guidance Notes. …Good design is essential to create attractive, functional spaces which enhance the quality of life of those who use them. Designing such places and spaces should take into account sunlight, orientation, overshadowing, planting layout, means of enclosure, circulation routes and combinations of compatible uses. … Good design is fundamental to sustainability. Layout design can reduce car use and facilitate public transport, walking and cycling, and building design can influence consumption of resources during both construction and occupation.
> "The appropriateness of a building will normally encompass scale and height, the position of the building on the site in relations to its neighbours and to the spaces

around it, the massing and rhythm of its elements and the use of materials. … The process of achieving good quality design is complex. Really good design needs an enlightened landowner/client and a good designer. The design process as a whole involves a range of players – developer, architect, local authority officers, members and the general public all with varying skills and responsibilities. . It is important to acknowledge that the design process cannot ever be rushed – it can take time to evolve design solutions particularly if community participation is involved."

The report concludes with the following key points on achieving good design through the planning process:

- Design is a fundamental planning issue.
- Planning authorities should take design seriously – they can make a difference.
- Good design will enhance quality of life.
- Government policy seeks a high standard of design from the planning process, and encourages planning authorities to get involved in design.
- Local planning authorities need to give a high level of commitment to good design.
- A clearly expressed vision is invaluable in improving design.
- Design involvement is more effective if it is part of a comprehensive approach and occurs early in the process
- Clear design policies in local plans, SPG, Design Guides, sustainability checklists, competitions and community planning will all contribute to achieving good design.
- Development control is where a skilled approach by local planning authorities can produce the greatest benefits.
- The design skills available to the local planning authority are critical: employing staff trained in design is the most effective approach.
- Design policies and the process for developing them are essential to underpin constructive design dialogue
- Involving the public and interest groups achieve a better understanding of design issues and a more satisfactory outcome for the community.

B.4 DETR's Housing quality indicators

While construction research has not addressed quality in a generic way, some construction sectors have begun to do so. The DETR's Housing Quality Indicators were published 23 April 1999 and are available on DETR's website.

The aim and function of these are as follows:

> "A key requirement of the system was for the Housing Corporation to be able to assess quality differences between schemes, and for RSLs and other developers to evaluate different schemes against a fixed brief. RSL or developers can assess the scheme themselves. Information is required on the location, site and the individual units that make up the scheme. Therefore, RSLs and other developers can use the HQI system to improve the quality of their housing schemes. As part of the process of completing the HQI assessment, potential developers and their architects should also be able to make design decisions that result in higher quality housing with minimal cost implications. They should be able to monitor their success in achieving good HQI quality scores, and learn from their successes and mistakes. The structure and application of the HQI system was formulated with these uses in mind."

Ten indicators measure quality, looking not only at the unit and its design in detail (5-9), but also the context and surroundings (1-4), and aspects of performance in use (10).

> "It is the profile of the ten different Indicators that gives the most useful information about the strengths and weaknesses of a scheme. The overall figure is a convenient aggregate, calculated on the basis of the Housing Corporation's weightings. It is important to be aware that a low score should not necessarily rule out the choice of

scheme at investment decision stage. There may be other considerations, for example need, that are of overriding importance."

"It should be possible to complete the HQI form as part of the normal design process." "Each Indicator receives one tenth of the total possible score, as they can all be viewed as equally, though differently, important in creating quality. Each Indicator has several parts and there are individual questions within each part. Within each Indicator, the weight of each part is shown alongside the part title. … Identical overall ratings may be achieved by projects with very different characters and qualities. The difference will be apparent as the scores are represented numerically and graphically, illustrating the strengths and weaknesses of a project, and how the overall score is made up."

"The scoring spreadsheet allows weights to be specified at two levels: between different sub-sections for a particular Indicator to show the relative importance of particular topics within an Indicator, and between different Indicators to show the relative importance of each Indicator. The scoring system includes standard weights at both levels, with the Indicator weights being 10% to give equal importance to each Indicator. In this spreadsheet, you as the user can also specify weights to take into account particular requirements and key factors relevant to the scheme."

HQI standard weightings			
Indicator	**Indicator Weighting**	**Subsection**	**Subsection Weighting**
Location	10%	Amenities	20%
		Retail	20%
		Schools	10%
		Play and leisure	10%
		Public transport	20%
		Absence of liabilities	10%
		Absence of noise sources	10%
Site – layout and landscaping	10%	Visual impact	33%
		Layout	33%
		Landscaping	33%
Site – open space	10%	Site security	20%
		Shared areas in flats	10%
		Children's play areas	20%
		Private open space/gardens	25%
		Car parking	25%
Site – routes and movement	10%	Routes and movement	50%
		Access to the unit	50%
Unit – size	10%	Area	75%
		Number of living spaces	25%
Unit – layout	10%	Furniture spaces, access, passing and activity zones	50%
		Additional desirable features	50%
Unit – noise, light and services	10%	Noise reduction	30%
		Quality of light, aspect and prospect	30%
		Standard of service provision	30%
		Additional desirable services	10%
Unit – accessibility	10%	Accessibility within the unit	100%
Unit – energy and sustainability	10%	Energy use, standards and features	60%
		Sustainability standards and features	40%
Performance in use	10%	Durability	25%
		Adaptability	25%
		Secured by Design	10%
		User satisfaction, post occupancy evaluation	40%

TABLE 17

B.5 Healthcare buildings and issues of design quality

NHS Estates, which is responsible for about 95% of the research activity on health care buildings, has an annual research and development budget of £400k. In October 1999, it published for the first time its priorities for the R&D programme. Among the five priorities the second was 'design quality in healthcare buildings. The others were 'using modular approaches in the design of healthcare buildings', 'adapting existing premises', 'using life-cycle costing to improve performance' and 'comparing options for refurbishment and replacement'.

Projects funded by NHS Estates R&D Fund include the following:

1996/7

The benefits of good building design (The Prince of Wales Institute of Architecture) [scoping study]

The effects of the physical environment on elderly psychiatric disorders (Bradford Community Health NHS Trusts and Bethlam and Maudsley NHS Trust)

1997/8

The Environmental Quality Primer (The Prince of Wales Institute of Architecture and South Manchester University Hospitals NHS Trust) [follow up to the scoping study].

Improving wayfinding in healthcare environments – a benchmarking and guidelines project (Healthcare Information Design)

Floor finishes in hospitals (Trent Architecture and Design)

Engineering fire safety in healthcare premises (NHS Estates)

Prediction of fire and smoke movement in hospitals (University of Leeds)

The architectural healthcare environment and its effect on patient healthcare outcomes (South Downs Health NHS Trust)

1998/9

Primary healthcare terminal (South Bedfordshire NHS Trust) [low cost terminal building acting as a base for mobile units to plug into]

Lifecycle costs for M&E building services (University of Northumbria Department of the Built Environment)

Database for Facilities Managers (Oxford Brookes University)

1999/2000 projects agreed

The architectural healthcare environment and its effect on patient healthcare outcomes, phase 2 (University of Sheffield)

Improving healthcare environments and facilities services by developing quality benchmark standards (The King Mill Centre for Health Care)

Some charitable trusts and charitable institutions (such as the Kings Fund, Nuffield Trust) also fund health care studies but do not have a primary focus on buildings for health care.

Several publications address issues of design quality in healthcare buildings including:

P Scher (1992) Environmental Design Quality in Healthcare, London, Arts for Health

P Scher (1996) Patient-focused architecture for healthcare, London, Arts for Health

NHS Estates (1994) Better by design – pursuit of excellence in healthcare buildings, London, HMSO.

NHS Estates (1995) Environments for quality care: health buildings in the community, London, HMSO.

The effect of therapeutic environments on medical outcomes has been studied by Ruben, Owens and Golden (1997) *Status Report: an investigation to determine whether the built environment affects patients' medical outcomes*, The Centre for Health Design, John Hopkins University. This reviewed 67 articles from the last 30 years in the medical and architectural literature. 59 demonstrated that some healthcare environmental feature was relevant to at least one patient outcome parameter. However, many studies have methodological flaws.

B.6 National building award schemes

What qualities are considered when awards are made to buildings? In the following table, the criteria used by a selection of award bodies are listed.

Award	Stated Criteria
Royal Incorporation of Chartered Surveyors	• Background and history of the project and identification of the consequences if the project had not gone ahead • Contribution made by the project to its surroundings in terms of its visual appearance and current and future use • Public reaction and benefits to the community • Achievement of value for money in carrying out the scheme, future economic viability and sustainable maintenance costs • Degree of efficiency and forward-thinking shown in the use of financial and human resources • Efficiency of the project's management after its completion and its ongoing viability in terms of occupation and use Other matters which will be taken into consideration are: • Arrangements for access for the disabled • Measures to reduce crime against land or property and their users • Steps to avoid pollution including the ability to reduce the effects of noise Size or cost will not be the determining factor but value for money and sustainability will be taken into account.
British Council for Offices	• Originality: what new ideas does the entry offer to BCO members? • Effectiveness of the delivered workspace: how ell does the building perform for the occupier? • Environmental responsibility: how well does the building respect the environment? • Asset valuation: does the building provide value for money? • Civic responsibility: does the building respect the surrounding community? • Management and maintenance: is the building designed in a practical manner? • Staff facilities: does the building provide health, fitness and art facilities

	internally or in the locality? • Overall workplace: does the building meet the needs of the occupier as well as the investor? The BCO include a 'Test of Time' category in their awards, with four additional criteria to be met: 1 Wear and tear: how well had the building stood up to the environment and changing user requirements. If the building had been altered how much of the original building remained? 2 Workspace: How well does it operate as a workplace of the standard sought by today's occupier and can it cope with IT innovation? 3 Building standards: Does the building comply with current occupier and investor requirements, including energy efficiency? 4 Civic responsibility: Has it been an influential building?
Brick Development Association awards	Creativity, aesthetics, choice of materials, functional design, execution of the brickwork, and sensitivity to the surrounding environment will be factors considered by the assessors.
Royal Town Planning Institute	• The enhancement of the physical environment, with recognisable social and economic benefit resulting from the achievement in terms of human happiness, greater safety, and better efficiency. • The originality of the achievement or approach. • The quality of the professional work involved in the design, in the development of planning concepts, and in the application of planning techniques. • The extent to which the scheme may serve as a model for work elsewhere or as a basis for the development of further related schemes. • The role played by the planner as an enabler and a co-educator.
British Council for Shopping Centres	• Commercial success, which reflects the service provided to the shopping public; the tenants retail score card which includes turnover/profit performance; and the developer/owner's success in achieving rental growth and capital volume performance. • Architectural/Design, incorporating integration with local town, pedestrian flows, design life, corporate design, ease of management and site optimisation. • Centre Management, with a focus on customer facilities, security, service charges, cleanliness and marketing. • Contribution to community through its leisure/recreational facilities and has it solved local problems or added to them.
British Construction Industry Awards	Quality of design and construction, value for money, application of quality management, performance against prediction, client satisfaction, concept, design/planning, and construction. Size of project is not considered a primary issue.
Housing Design Awards (sponsored by DETR, NHBC, RIBA and RTPI)	To award the very best in housing planning and design. Marks are won for projects well related to the local environment, for sensitive layout, innovation and the provision of homes suited to people who live in them and of the wider community."

TABLE 18

Other bodies (Royal Institute of British Architects, Civic Trust, British Institute of Facilities Management) also make awards, but their judging criteria are less explicitly stated.

B.7 Building rating schemes

Eric Loe (personal communication) has drawn attention to the following methods for rating buildings:

1 In 1991/92 DEGW and IT consultants Technibank undertook a major research project to assess the status of intelligent buildings in Europe. The project, Intelligent Buildings in

Europe (IBE) led to a definition of four types of buildings that responded to differing requirements:

- Use value building; custom designed for the owner-occupier, maximises the use value for the end user organisation.
- Exchange value buildings, developed speculatively, and designed to maximise the building exchange value as a commodity to be traded.
- Image value building is designed to maximise the image value of the building often at the expense of efficiency or other qualities.
- Business value building is where use, exchange and image are synthesised into a building where technology is fully exploited to maximise the range of options for the end user.

Users, owners and investors in buildings have a crucial interest in knowing what the exchange value of their asset is in the market. Few building owners would embark on construction if the cost to build exceeded its worth, nor would users pay rentals beyond their perception of the property's worth to them.

2 DEGW Orbit 2 Study (Becker F., et al *Orbit 2 Executive Overview,* Harbinger Group, Norwalk CT, 1985). This developed a methodology for determining the degree of match between the building, the organisation occupying it, and the information technology being used.

3 BREEAM. The Building Research Establishment's environmental assessment method.

4 IQ Rating, developed by David Boyd and Ljubumir Jankovic at the Intelligent Building Research Group (University of Central England), set out to assess and score a particular building profile against comparables in the market place.

5 Intelligent Building in Europe Study (IBE) in 1991/2 (DEGW/Teknibank, *The Intelligent Building in Europe,* DEGW, London, 1992.) developed a self-rating methodology aimed at simplicity in use to provide a rapid general rating of building intelligence.

6 Real Estate Norm (REN) developed in the Netherlands as a method for evaluating office location and office buildings. (Adair A. Downie M.L. McGreal S., Vos G., (Eds) *European Valuation Practice –Theory and Techniques* E & FN Spon, 1996.)

7 Building Quality Assessment (BQA) emerged from the Centre for Building Performance (CBPR) at Victoria University in New Zealand. It sets out to provide a balanced assessment of the quality of the building as a whole, and of its component parts, against the requirements of a range of users.

8 The Building Rating Method (BRM) has been published (set out in 'Intelligent Buildings in South East Asia' edited by Harrison, Loe and Read, E and FN Spon, 1998). The BRM is based on the synthesis of building supply/organisational demand and the concept that building elements have differing life cycles. Buildings are rated in five sections, commencing with the Building site and its locational factors, leading into rating the building shell, and the building skin. The organisational and work process issues of the building occupants are then assessed, followed by a rating of the building's services and technologies. Scores are plotted first on a matrix to examine the relationship between site accessibility and building adaptability, and secondly to look at the match between organisational demand and the levels of provision of building technologies and systems. The key strength of the BRM compared to earlier models is in its ability to direct users in developing intervention strategies e.g. redevelop the building, change the site usage, improve the infrastructure. The Building Rating Method, with its adoption of a whole building and its users scoring, automatically incorporates an evaluation of where good design has introduced building and occupant benefit.

B.8 The RIBA's 1999 study of quality and value

The RIBA, through its Future Studies group, recently commissioned Ken Worpole to write a booklet on *The Value of Architecture – design economy and the architectural imagination*. It was reviewed in the RIBA Journal, November 1999. The booklet:

> "…. is about the role that architecture and good design can play not just in urban regeneration, but in adding both symbolic value and economic value to the settings and buildings in which people live, work and enjoy their leisure. Good architecture and good design together create settings where people are able to function and communicate

more effectively; investment in good architecture and design can produce longer lasting, more resourceful and adaptable settings, which in the long term can save money and be more energy efficient.

"The power of architecture to excite the imagination, to construct buildings and places of great beauty, to address complex problems of light, space, time, function, efficiency and adaptability even in the most difficult environments and settings, is still a source of great inspiration and a skill that is in greater demand perhaps than ever before.
There are four principal arguments to this study, which is intended to provide a general introduction to the issue of the 'added value' which architecture and good design can bring to the urban setting. These are that architecture and design can make a significant contribution to:

1 The wider economic impact of attractive buildings and settings, the flagship architectural projects which have a clear economic impact on the towns and cities in which they are located.
2 Achieving greater value for money through technical and intellectual expertise - how the skills and expertise of the architect can provide cost-effective solutions to complex problems, not only saving money but providing extra benefits in terms of increased space, easier access, more efficient living and working conditions.
3 The value of design and architecture in enhanced individual and social well-being – the issue of how design can enhance human values. The use and experience of buildings and places – the ability of buildings and places to provide both heat and coolness, light and shade, companionship and sanctuary, excitement and rest, safety and security, greater legibility and assurance, and a greater sense of locality, identify, civic pride and belonging. Architecture can be a vital part of a wider notion of quality of life.
4 Using design to achieve greater adaptability, energy efficiency and environmental sustainability – greater regard for the orientation of the site, local topography and environmental factors, and designing and fine-tuning buildings that take advantage of these factors to minimise energy use and provide comfortable and pleasant environments in which to work.

The review by Andrew Rabeneck is critical. He suggests that good design flourishes when:

- There is a meeting of expectations between client and architect
- There is a capacity for inspiration
- There is trust rather than suspicion
- There is respect in both directions
- Creativity is fostered and creativity given.

Without these, he argues, there will be no 'good design'.

Section C Achieving quality and value - process issues

C.1 Some recently completed and current studies of the design process

In their paper "The cost and value of design" (*Architectural Research Quarterly*, vol 1, summer 1996) Bryan Lawson and Simon Pilling set out to explore the cost of providing architectural services and the value placed on the services by clients. Eight interviews were conducted with clients and twelve with architects. The authors say of clients interviewed "All recognised the potential role of the architect and the unique contribution of design." The study suggests there is quite a lot of diversity among clients' views (for example, about how to identify an architect, when to bring them in, etc) and among the architects' views (about briefing, project management, in-house management. The authors conclude that "much of the frustration for both parties stemmed from lack of appropriate communication and a failure to engage the client into

the process at the right time…. Schools of architecture should seek to engender a more client centred approach in the educational process, to develop the necessary skills of listening and extracting the brief, negotiating agreements, making presentations and managing client relationships." The study was funded by an RIBA Research Grant.

Lawson has a long term interest in the whole subject of the design process and is the author of the influential text *How Designers Think* (Butterworth). He and Pilling are leading a study called *Clients and users in design education* (CUDE), being managed jointly by Sheffield University and De Montfort University with funding from HEFCE. It has sought "to develop new ways of teaching and learning in architectural education, specifically in the areas of teamworking and client & user focus, using the design studio as its vehicle for change. A conference was held in April 1999, and Simon Pilling is editing papers for publication in 2000.

Lawson is also engaged in research with Salford University on an EPSRC/IMI funded project called *Advanced Decision Support for the Construction Design Process*. Working with BDP's Manchester office, the team is trying to devise a system to track design changes made during a project and record the reasons for them so as to gather knowledge of design rationale to feed into later projects. The intention is to incorporate information management and decision support techniques that were developed in a previous EPSRC-funded project (COMMIT) into Bentley Microstation. The project has been running for six months, but no results are available yet.

Research into effective design teamwork started at Cambridge University's Martin Centre in 1997 with a project called *Achieving quality through interdisciplinary teamwork in design* (AQIT) funded by EPSRC and DETR under the LINK IDAC programme. Its aim was to study the practice and the benefits of interdisciplinary teamwork practices in three case study organisations - Essex County Council (with WS Atkins), Ove Arup and Partners and Building Design Partnership. It also drew on the management science literature about effective teamwork. The main outcome is a booklet about effective teamwork in design, whose publication is currently being negotiated with a commercial publisher. The booklet includes a wealth of advice about forming and managing a design team, harnessing its collective energy, running design team meetings effectively, and dealing with conflict and inter-professional rivalry. A follow up study Measuring the effectiveness of interdisciplinary teamwork in construction runs from 1999 to 2001 and involves tracking the three buildings beyond their design phase and into construction on site, handover and occupation. One of the projects (The Wick School Project for Essex County Council) is based on partnering principles and has accepted by the Movement for Innovation as a Demonstration Project (M4I project 110). The aim is to document longitudinal studies of the briefing-design-construction-occupation cycle. The research is intended to provide best practice exemplars that illustrate the benefits of integration between briefing, design and construction.

A third project at the Martin Centre is called *Mapping the Design Process during the conceptual phase of design* (MDP). It is funded by EPSRC/IMI and led by AMEC. The overall aim is to improve the quality of concept design, which is the phase of design when the potential for adding value is at its maximum. The research seeks to improve the management of the conceptual phase of design by establishing a robust and co-ordinated approach, and by encouraging the introduction of techniques such as Value Management. In particular the research is producing a model flow diagram for conceptual design which obviates the need for design teams to reinvent the process in each new project. The diagram is consistent with BAA's Project Process and Salford University's Process Protocol, and seeks to 'drill down' to the next layer of detail of

these two (mutually consistent) process models. It is being implemented as a series of linked web pages authored using HTML for future dissemination via the internet.

CIRIA completed a project during 1999 called *Management of technical excellence in design organisations: benchmarking good practice*. Ghazwa Alwani-Starr was the project manager. 12 CIRIA members funded it, but the results are not yet in the public domain. The same members are now funding a new project called *Performance measures in design organisations* (featured in CIRIA News, issue 3, 1999). This will aim to gather information and experience on current practice in performance measurement in design offices and develop a framework for performance measurement and a set of performance indicators which may be adopted by design organisations. There is a three stage programme:

1 The development of a set of generic performance measures with process and product separated. The process of design is considered to consist of: *conception activities* (identification of need, development of brief, preparation of the case for investment, etd) and *development activities* (developing design schedule, detailed design, design reviews, etc). The outcome of design is divided into: realisation of design and satisfaction with the product (defined as satisfaction of client brief, satisfaction of end user requirements, client delight, etc.)
2 Benchmarking the performance of participating organisations. A number of indicators will be selected.
3 Recommendations for improved performance. The benchmarking exercise will highlight areas where participating organisations need to improve their performance.

The output from the work is expected to be a framework for performance measurement of design activities. Key performance indicators will be recommended with guidance on how to apply them.

The Society for the Advancement of Architectural Management is seeking funding for a research project entitled *Value through Design* (information from Colin Gray of Reading University). The mission statement for the project is “To champion a design agenda which places design foremost as the driver to produce more effective value added solutions.” There are three (or perhaps four) parts to the study:

1 To create a better understanding of design and its contribution to successful architecture
   - Developing a shared language and values
   - Recognising the design is a process of developing solutions over time
   - Understanding the design involves a large number of people and skills
   - Articulating the range of benefits that design can open up
   - Removing the fear of technological experimentation
2 To act as a catalyst between education, research and industry
3 To create methodologies for defining value and for determining and interpreting professional values.
   - Raising awareness
   - Establishing and communicating and understanding of the process
   - Assessing the contribution of available techniques such as value management etc
4 Best Practice design
   - Systematically learning from successes and failure
   - Understanding the structures which characterise the designer/client transactions

The values and benefits of design have currently been defined within the project as:

- Utility value – functionality, spatial effectiveness, spatial quality
- Technical – buildability, integration of systems, construction processes
- Sustainability – economic life span of components, maintenance, environmental impact
- Cultural value – aesthetics, meaning, philosophy and history The project is currently seeking funding.