



Offices, value and design

A discussion document

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RESEARCH TEAM

Bartlett School of Planning, UCL

Matthew Carmona

Claudio de Magalhães

Mike Edwards

Louis Sieh

Investment Property Databank

Ian Cullen

Mark Callender

Clara Westlake

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Contents

Introduction 5

- The structure of this paper 5
- The scope and limitations of the review 6

Part One: Conceptual Discussion 7

- Methodology of review 7
- Value and valuation 9
- Market value 10
 - Worth and appraisal 10
 - The model of the valuation process: The derivation of price 11
 - Why normative valuation methodology does not help us 13
- Architecture and urban design 14
 - The scope of “design” in this study 14
 - Design conceptualisation and design dimensions 14
 - Towards a holistic understanding of design – useful examples 15
- Office real estate developments 16
 - The scope of the office real estate field 17
 - Value in office real estate 19
 - Issues of real estate and business 19

Part Two: Summary and Categorisation of Literature 25

- Types of studies 25
- Type A: Conceptualisations of design 26
 - Some fundamental qualities 26
 - Design and office developments 27
 - A multi-constituency approach 28
 - Selection of dimensions 29
- Type B: Studies that assess building characteristics 30
 - Assessment tools 31
 - Application to the conceptual framework 37
- Type C: Studies that link design characteristics of the built environment to value 39
- Type D: Dissecting the valuation process 44
- Type E: Studies that propose new valuation methodologies 48
 - The question of depreciation 49
 - Valuation methods 50

Part Three: Intermediate Conclusions 56

- Findings 56
 1. Summary of the literature 56
 2. Values, not value are the root cause of problems 57
 3. Multiple actors with different priorities operate within an unresponsive market 58
 4. Studying normative valuation methodologies is not useful 58
 5. The value of MRA 59
- Recommendations 59
 1. Understanding value and design 59
 2. It is the market that needs convincing 60
 3. “Oiling” the market 60
 4. A behavioural approach is needed to studying valuation 61
 5. Towards a more explicit recognition of design value 61

Part Four: Moving the Research On 62

- Stakeholder interviews 62
 - Background and definitions of design and value 62
 - Design, costs, property value and profitability 63
 - Valuation methodologies 64
 - What the interviews confirmed 64
 - The expert seminar 65
- A proposed methodology 67
 - A) An analytical framework 69
 - B) A performance/quality index 70
 - C) Qualitative testing 71
 - E) Synthesis and dissemination 71

Part Five: Bibliography 72

Annex A All studies reviewed: Dissecting valuation methods and techniques 74

Introduction

Design and its impact on office development has become a key topic within the built environment sector during the past five years through a combination of fresh research work and attitudinal surveys. Such work has focused on how design effects workplace efficiency, value, and a host of sustainability factors. Reflecting some of this new work, this discussion views two surveys in 2004 as convincing and important, and when considering the remit of this study, these two research reports form a basis for this appreciation of the link between offices, value and design.

The first, an NOP poll for Ryder HKS, Building Design and Property Week, suggests that a third of office workers find the exterior design of their workplace 'depressing' or 'fairly depressing' and only 6 per cent feel enthusiastic about their work environment. Moreover, 60 per cent of workers said that shared spaces in the office were average, fairly bad or bad, and that despite heavy investment in modern office space, many office workers are 'annoyed' about the layout, lack of space and lack of windows in their workplace (Thompson, 2004).

The second survey carried out by FPD Savills (2004) for the British Council of Offices and published only a month after the first, suggested that better office environments will become a key consideration in business success. The researchers argued that issues such as design and location will increase in prominence over the next 20 years as employers increasingly focus on the satisfaction and happiness of their workforce.

Each survey links three essential ingredients: offices, value (in these cases to users and businesses) and design. This paper also focuses on these ingredients and in doing so attempts to do three things:

First, it reviews literature and research that has attempted to link the external architectural and urban design characteristics of office developments to their exchange values. In particular, studies that have made explicit any relationships between "design" characteristics and real estate value, or which have attempted to circumscribe "design characteristics" as a driver of value were targeted.

Second, the paper reviews real estate and other asset valuation methodologies for their suitability to incorporate consideration of design issues within their valuation mechanisms.

Finally, it reflects on how a research methodology could be devised to reliably and accurately test the link between value and external architectural and urban design quality in office developments.

The structure of this paper

The paper is in five parts:

- Part One is the review's conceptual framework and defines the scope of the review. It sets out in a logical and methodical manner the way in which the reviewed theories, concepts and studies relate to each other.

- Part Two summarises the theories, concepts and studies reviewed. These are categorised into “study types” gathered into five categories (A-E).
- Part Three contains short intermediate conclusions and makes recommendations for a way forward, highlighting the areas where research is most urgently needed
- Part Four tests the intermediate conclusions through interviews with six experts in the office property/design sector, and subsequently at an Expert Seminar held at the RICS in London on the 30th April 2004 in front of an audience of investors, property advisors and surveyors. The conclusion to this testing process has been a revised possible research methodology utilising the Investment Property Databank that begins the process of examining the theories and concepts in Part Two, and some of the conclusions in Part Three. It represents the next step for research funding.
- Part Five is the bibliography.

The scope and limitations of the review

The main limitation was time. This review is therefore broad rather than deep, as the aim has been to reveal a general rather than detailed picture of the literature. It therefore touched on the fields of real estate valuation and management, facilities design and management, architectural design, urban design, business performance management and construction management.

PART ONE: Conceptual discussion

Methodology of review

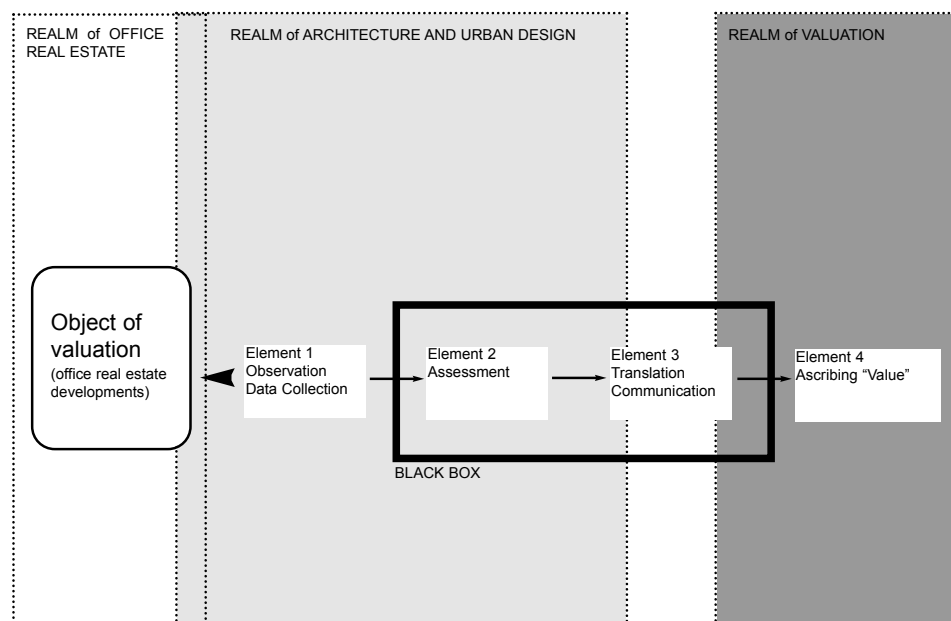
A systematic search using the “title, keyword, abstract” option was carried out on the Ingenta database with the following three words and all possible combinations with their synonyms as below:

- Value: value, valuation
- Design: design, architecture, architectural, building, offices, commercial
- Property: property, real estate

Key sources were identified from whose bibliographies further research was identified, including Haynes et al (2000) and CABE (2001).

From the initial findings, a hypothetical conceptual framework was developed (**Figure 1**) that became the starting point for the literature and research review, and thereafter represented a diagrammatic depiction of the scope of the review.

Figure 1 Conceptual Framework for Literature Review



The conceptual framework conflates two key elements across its vertical and horizontal dimensions:

Vertical: Three bodies of knowledge

Part One of this report discusses conceptual issues around three bodies of knowledge that delineate the conceptual scope of the review. These are reflected in the “vertical domains” of the conceptual framework:

- Realm of office real estate development – the “object” of valuation
- Realm of real estate valuation – a series of activities aimed at estimating the market price or exchange value of the office real estate developments
- Realm of architectural and urban design – the particular aspect of developments examined for its contribution to overall real estate value

Horizontal: Theoretical model of valuation

Running horizontally across these domains is a generalised theoretical model of the valuation process, which roughly reflects Levy and Schuck’s (1999). This consists of four elements that in practice, are not as neatly discrete as described here:

1. Element 1 – observation or data collection on the relevant characteristics of the object of assessment.
2. Element 2 – assessment and comparison of the characteristics and the translation of this assessment into a form that can be valued.
3. Element 3 – the communication of that assessment in its value-able form.
4. Element 4 – the ascribing of a monetary value to the object.

Objectives in terms of Figure 1

The objective of this literature review is to examine the range of studies that have attempted to find out how and why an observed characteristic of the object is translated into a monetary value, and to help make this process explicit. The suspicion that traditional valuation methods do not or cannot capture fully the advantages of “good design” has been a driving force for the commissioning of this research.

The concern is therefore with “whether property valuations are keeping pace with changes in the market” (Rose 1994, in McParland 2000 p85), and that traditional valuation methods have a tendency not to place property in the context of the wider economy, by ignoring the vocabulary and analytical techniques of other markets. The present study tries to uncover or develop techniques by which “design” characteristics may be more explicitly and sensitively captured in the valuation process.

Study typology

In order to map the literature clearly, a study typology was devised which relates each research project or relevant piece of literature (each study) to the four elements in the theoretical model. These are discussed in Part Two.

Real estate valuation

The next section discusses the notions of value, and the link between valuation and value in the real estate arena. This section does not review normative valuation methodologies, a brief review of which can be found in Part Two and labelled “Type E” studies. However the present section does explain why these normative methodologies do not actually address the problem of “design” characteristics being apparently left out of valuation.

Value and valuation

Real estate-focused definitions of value apart, value is most generically defined as “a measure of the worth of something” (Carmona 2001 p14). This generality means that this definition suffers from an unavoidable “spread of opinion over the meaning” of the word “value” (Eccles 1996). It is therefore important to have a coherent understanding of some of the key debates around the practice of valuation and the alternative, sometimes conflicting, notions of “value” in real estate.

Private and public value, exchange and use value

The concepts of value have largely been developed in the field of economics, and while economic value is only one of many ways of defining and measuring value, it is useful to help explain how people make choices that involve tradeoffs in allocating resources (www.ecosystemevaluation.org). Economic value is measured by the most someone is willing to give up in other goods and services to obtain a good or service.

Measures of economic value are based on what people want – their preferences (www.ecosystemevaluation.org). Thus, when defining or measuring a value, a conceptual reference point must be a “stakeholder”, to whom this “value” will accrue.

The conceptual distinction between exchange and use value are important to the present study. In economics, exchange value is related to market price as determined by supply and demand and would be derived from some observation of market behaviour of the good; this may or may not reflect any universal intrinsic value of the good. Use value on the other hand, is related to the price of production, as determined by the labour theory of value, and reflects the use to which a good can be put; these two values can be quite different for the same good or service (www.ecosystemevaluation.org).

These two conceptions of value are “private” conceptions, as the benefits accruing are to private individuals or organisations. A third and “public” conception of value is one that has to be considered when discussing the impact of office development on the public realm or its contribution to its locality. This is described by Abelson (2000, p5), discussing the impact of heritage buildings, as the “public benefit”, and draws on a “common distinction in economics – between internal and external impacts”. Thus the public benefits are the external benefits that cannot be directly appropriated by the owner.

These, like most concepts of value are rooted in classical and neo-classical economics and so tend not to take into account (or do so inadequately) the aggregated and predominantly social and cultural understandings of the term. (Eccles 1996).

Market value

The definition of value most often used in real estate valuation, and the one used in this study, is simply a practical one that “will serve the present purpose”, and which concentrates on “value in a market situation, value in exchange – or market value” (Eccles 1996). This may or may not reflect wider social, aesthetic or other public notions of value.

Baum and Crosby (1988, in Parker 1999 p402) define real estate ‘valuation’ as “the estimate or prediction of the most likely selling price”, and suggest that it is distinguishable from ‘worth’ which is specific to an individual and subject to subjective estimates of factors relevant to that individual. Baum et al. (1996, in Parker 1999 p402) therefore define ‘market price’ as “the ‘recorded consideration paid for a property”.

The most usual definition of market value is that of “Open Market Value” i.e. “the best price at which an interest in a property might reasonably be expected to be sold by private treaty at the date of valuation, assuming a willing seller; a reasonable period within which to negotiate the sale, taking into account the nature of the property and the state of the market; that value will remain static throughout the period; that the property will be freely exposed to the market, and no account is to be taken of an additional bid by a special purchaser” (Royal Institute of Chartered Surveyors Asset Valuations Standards guidance notes quoted in Darlow 1983, p 261).

McParland et al (2000) observe that the determination of market value is derived from some observation of market behaviour, recognising that “despite the numbers of alternative definitions relating to value, the central axis on which most valuations are founded is market value” (Horsley 1992, in McParland et al 2000 p90). They go on to define market value as “the price that one would expect to be paid under specified conditions and is often defined as the most probable selling price”.

The valuation process simplifies vastly differing natures of different spaces used for different activities into a simple economic estimate of market price, and it is from this simple principle that valuation techniques have been developed.

Worth and appraisal

“The calculation of worth is normally undertaken by appraisals rather than valuations” (Baum and Crosby 1995 in McParland et al 2000, p95) which can capture the various components of use value reflecting the property’s usefulness. The latter implies that techniques such as explicit cash flow analysis, are needed to capture these various components. These would be based on a combination of market information and user-specific information, and would seek to “determine the future behaviour of the cash flow and attempt to quantify all the factors that influence it” (McParland et al 2000 p96).

Appraisal “considers the value or worth to a particular purchaser after taking account of his individual circumstances, his investment portfolio and possibly different assumptions about the future. Most investors, particularly the larger institutions, would inevitably undertake both a market valuation and an appraisal before proceeding with a purchase” (Darlow 1983 p261).

Notably, French and Wiseman (2003) have argued that although in the past, reliance of valuers on valuation methods that rely on comparison to determine “price” has led to an artificial divergence of ‘value in use’ and ‘value in exchange’, the recent move of companies to reassess the pricing of space has led to an awareness of the “worth” of space and thus, altered their view of what they are willing to pay, leading to a convergence of value in use and value in exchange.

Thus traditional “valuation” is about finding out the exchange value of an asset and does not necessarily explicitly consider use value. Appraisal, on the other hand, does take into account an asset’s use value. Bottom, McGreal and Heaney (1999, p342) suggest “two types of appraisal techniques [for assessing building performance] exist, namely user-based systems...(which utilize the occupants’ responses to evaluate the adequacy of buildings)...and expert-based systems...(which utilize the expertise of a building/facilities professional to make an assessment of the adequacy of individual or groups of physical building features)”.

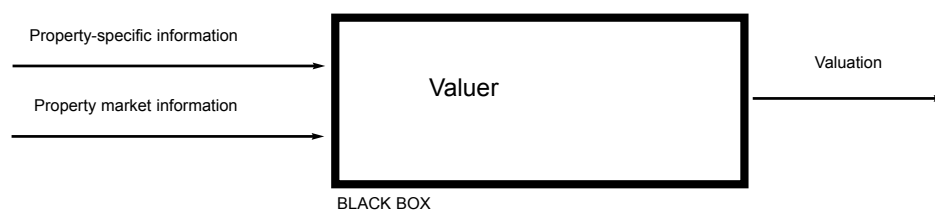
The model of the valuation process: The derivation of price

At its most generic and conceptual (as opposed to practical), valuation simply means the process by which value can be attributed to a good, service, resource or enterprise. The theoretical model of the valuation process in **Figure 1** depicts this.

“With respect to valuation methodology, research has generally sought to model the valuation exercise as a black box process, where valuers combine a previous estimate of value with signals (hedonic prices of property characteristics) extracted from transaction data in order to estimate the market value of a particular property” (Levy and Schuck 1999 p381). McParland et al (2000) note that there is increasing pressure to develop more transparent investment valuation methodologies and practices in the context of the UK within a European perspective.

The valuation process has been depicted as a “signal processing system, where the “valuer’s task involves the filtration and interpretation of property and market information ... to produce an estimate of value” (Levy and Schuck 1999 p382). This is the normative model, summarised in **Figure 2** (from Levy and Schuck 1999, p381).

Figure 2 *The Normative Valuation Model from Levy and Schuck 1999, p381*



The four horizontal elements in **Figure 1** depict such a filtering and interpretation, or translation process. However, as a result of professional disciplinary boundaries, the two vertical domains representing work in the “realm of architectural and urban design” and the “realm of valuation”

usually describe value in different terminology that is seen to be more or less objective by the professions concerned and more or less quantitative.

This is because professions in either realm are equipped with quite different specialist skills, and may focus on different aspects of the object of valuation. Moreover, the different actors in property approach “value” from different traditions with very different value systems; and as a result, each look for different sorts of “value” in the object of valuation (for example, see Guy 1998). Thus what constitutes “good value” can be quite different to designers and to property valuers.

Nevertheless, valuation may be considered to be a sort of “translation” or interpretation between these two “knowledge domains”, a term drawn from the study of human information processing (Hardin 1999). In any attempt to take “design” characteristics of a property into account in a valuation, the valuer has therefore to filter and interpret design information.

Figure 1 crudely represents this process, although its four horizontal elements are not definitive, not always discrete, nor necessarily consecutive. Splitting the process in this way nevertheless enables the optimal dissection of design evaluation for the purposes of this study.

Element 1: Observation and data collection

This element addresses the object of measurement. The observation and recording of this data may be through a prescribed method (for example, certain characteristics may have been identified as dimensions relevant to the valuation exercise, which is a close ended approach) or not. In the evaluation of design, the most common aid to appraisal is a list of design dimensions or characteristics, which is an attempt to make explicit the judgement of design.

Element 2: Assessment and comparison of the relevant characteristics

This means the evaluation of the data and observations in element 1 against some comparator and within some context that will allow a “value” judgement to be made on it. This value judgement is not about monetary value, but simply about whether the characteristics observed make the object of observation better than or worse than something else.

In the assessment of design characteristics, which are sometimes subjective, elements 1 and 2 are often indistinguishable, as judgements are often made at the point of observation, with simultaneous translation into a commentary or even a rating.

Element 3: Communication and translation

Communication of the assessment result into a value-able form, in effect a translation of an observation made in non-value terms into value-able terms.

Element 4: Ascribing monetary value to the translated terms

This final step is the attribution of a monetary value to those value-able terms.

There are three basic means of imputing value, some of which will be discussed in detail in Part Two under “Type E studies” but are:

1. revealed willingness to pay
2. imputed willingness to pay
3. expressed willingness to pay

Revealed willingness to pay methods observe the behaviour of market participants and infer the value of a good or service from their actions. For example, market pricing and hedonic pricing techniques are both “revealed willingness to pay” methods.

Imputed willingness to pay methods include: damage cost avoided, opportunity and replacement cost, and substitute cost methods. These were developed to value environmental assets.

Expressed willingness to pay methods ask market participants or users what they are willing to pay, and infer the value of a good or service from their answers. Examples of techniques include contingent valuation, contingent choice and conjoint analysis methods.

Why normative valuation methodology does not help us

What is commonly called “valuation methodology” addresses only element 4 of this model. These methodologies make explicit the assumptions on which a monetary value of a property is derived. They all fit within what Levy and Schuck call the “normative model” (**Figure 2**).

Almost all valuations are at least partially “subjective” and not totally rational, and therefore require some judgement and estimation. Even if a clear step-by-step methodology exists and is adhered to, judgement within or outside these steps often have to be made as each property is unique in some way; thus full “codification” of every valuation sub-process is impossible. In Quan and Quigley’s model of price formation, a valuer is described as having to extract the “price signal from the ‘noisy’ transactions ... (and to specify) the appropriate weighting of the information in a given transaction with the stock of prior information available to (him). This stock of information is the experience and human capital of the appraiser, which forms the basis for signal extraction” (Quan and Quigley 1991, p141).

In the professional practice of valuation in the UK, it was only in 1976 that the lack of formalised standards for valuers and valuation was addressed through the publication of the ‘Red Book’, or ‘Guidance Notes on the Valuation of Assets’. “Indeed many valuers (had previously) adopted the view that the less information given about the composition of their valuations, the less likely they could be challenged” (McParland et al 2000). McParland et al suggest that “arguably one of the most important outcomes of the Red Book was the identification of five principal valuation bases” (McParland et al 2000 p86). However, these standards do not aid the present study because they only help make transparent element 4 (ascribing monetary value), and not any of the preceding elements, which describe how valuers perceive design. It is within these earlier assumptions and decisions concealed within “valuation bases” that the key to understanding the valuation of design characteristics lie.

Eccles (1996) argues that these critiques “do not consider the root of the problem. Arguments over the technicalities of valuation methods fail to question their fundamental *raison d’être*” (Eccles 1996, p41). For him, “The concept of value to those whose task it is to assign a value to sections of the built environment is a complex technical calculation but a simple philosophical idea. The majority of valuations are based upon projections of future income streams provided by the property to its owner over a specified lifetime”. But because valuation techniques follow from the ideological structure in which they are situated. Techniques cannot be investigated before an investigation of their conceptual framework” (Eccles 1996, p40).

Because valuers are people who are “neither entirely objective nor completely rational” and are generally affected by a limited, if highly expert, “knowledge domain” a body of “behaviourist” research has developed as an approach to examining the valuation process. This encompasses how valuers make judgements and why design characteristics appear to be excluded from traditional valuation methods. Studies taking behaviourist approaches to valuation are reviewed in Part Two of this report.

Architecture and urban design

This section describes the field of architecture and urban design inasmuch as they act as one of several relevant aspects to which value and price components may be ascribed, or by which, in reality, they may be caused. In some of the studies reviewed here, it is “building quality” that is examined, and the terms “architecture” and “design” are applied only to aesthetic concerns. But this is inevitably a very limited a view of architecture and urban design.

The scope of “design” in this study

In this study, “design” refers to a difficult to define or to isolate category of the characteristics of built environment elements (in this case, office buildings). The key observation on the definitions of “design” (as of “quality”) in all the studies reviewed is their sheer variation.

For the purposes of this literature review, “design of commercial property” will usually be taken to mean the design of the basic layout of the building, its “shell” and its location within its context (its urban design properties), rather than its “fitout” which is the subject of related research being undertaken by DEGW.

Design conceptualisation and design dimensions

Design conceptualisation is simply a way of explaining what constitutes design, usually with the aim of making it operational, either for specification purposes, or for evaluation purposes. The conceptualisation of design has been addressed by many authors, from Vitruvius to CIBE, and a bewildering range of design conceptualisations exists. As already argued, this is because “good design” means different things to different people who place different levels of importance on different aspects of design, whilst assessment is carried out for very different reasons.

A common device for conceptualising design for the purposes of observing, describing or assessing it is the use of “dimensions”. Dimensions are the aspects of an entity that, if observed and described, will give an idea of the nature of that entity. Lists of dimensions have become widely used as the guidelines against which observation and thus data collection on “design” characteristics are made and are common tools within elements 1 and 2 of the theoretical model of valuation (**Figure 1**). In this context they help users (particularly those with little design knowledge) to make an informed judgement on specified aspects of a project.

These lists of dimensions may also be the best way to objectivise the more subjective aspects of design. This trend towards objectivisation also serves to make decision-making more explicit, and therefore (potentially) more easily value-able. However, the danger is that such moves toward a more objective view of design can also lead to a reductionist conceptualisation of design.

Reductionist design conceptualisations in design

The widespread use of dimensions reflects the fact that much effort to counter the “mysterious” and “fuzzy” nature of design has concentrated on a “rational design machine” model based in turn on an analysis-synthesis model. This aims to take programmatic information as input (so-called building functions) and assemble, organise and translate it into a design.

Brown (2001) argues that this model which is still the tacit model accepted in the business and real estate communities (and indeed by many design evaluation experts), is a fundamental misconstruing of science. This is because process does not necessarily result in a good product, and neither (necessarily) will the conscientious fulfilment of every single dimension of so-called “good design”.

To take an analogy used by (Beckford 2002), “If we remove the engines from a jet aircraft neither they nor the aircraft, will fly; flight is a product of their interaction and interconnectedness, a synergised outcome. It is a property which belongs only to the complete aircraft and to none of its parts. Properties such as this are called “emergent” – they “emerge” from the interaction of the various system elements. This means that when examining the properties and behaviour of an aircraft, we must look at it in its totality, not just at its components, since the whole may have properties not found in the components”.

This applies equally to a holistic understanding of “good design” in buildings. Thus although reductionist techniques may help in assembling or assessing good design, like “good process”, they do not guarantee a good result until the whole ensemble has been considered.

Value on the other hand (in the broad sense), is something that is stakeholder-specific, and only a selection of components of quality will be taken into account when determining value. In the case of exchange value, it is those quality components that coincide with the aspects that the “market” thinks is worth something.

Towards a holistic understanding of design – useful examples

Given these obvious limitations of any approaches to establish a holistic design conceptualisation, and the fact that any conceptualisation will be contested, no attempt is made in this report to

identify a new set of design dimensions for office buildings. Instead a simple reminder of two useful and widely adopted conceptualisations are included here as a means to establish the broad field of interest.

These establish design principles at two different but inexplicably linked scales: architectural and urban design. First, are the twelve criteria used by CABA (2001) in their design review activities that focus predominantly on the architectural scale:

1. order
2. clarity or organisation, from site planning to building planning
3. expression and representation
4. appropriateness of architectural ambition
5. integrity and honesty
6. architectural language
7. conformity and contrast
8. orientation, prospect and aspect
9. detailing and materials
10. structure, environmental services and energy use
11. flexibility and adaptability
12. sustainability.

Second, are the seven design objectives adopted by Government in 'By Design' (DETR & CABA, 2000), which focus predominantly at the urban design scale:

1. character
2. continuity and enclosure
3. quality of the public realm
4. ease of movement
5. legibility
6. adaptability (also included above)
7. diversity.

CABA (2002) argued that as regards architectural design "We believe that assessing quality is to a large extent an objective process. Ultimately, of course, some questions come down to matters of individual taste and preference. It is not often, however, that questions of this kind are important in deciding whether a project, judged in the round, is a good one. What matters is quality, not style". The criteria reflected these broader and, arguably, more objective dimensions of design. Inevitably they focus primarily on the more 'public' external design factors (see Part Two).

Office real estate developments

This section defines "office real estate" which is the subject of the valuation exercise in the present research. "Office real estate" consists of many overlapping fields, which are not always well "keyed in" to each other.

This study focuses on office property that is rented by the occupiers, as renting is the primary tenure of occupation. “For most office-based companies, the question of ... value is a question of renting, not buying or selling space. In the City of London, 73% of firms do not own their own premises” (Crosby and Murdoch 1998 in Desyllas 1999). A recent US survey in 50 metropolitan areas similarly found that 75% of firms did not own their own premises (Wheaton and Torto 1994; Dispasquale and Wheaton 1996, in Desyllas 1999).

The scope of the office real estate field

Office real estate refers to property which is used for commercial activity, but excludes retail uses. Haynes et al (2000) observed three overlapping but imperfectly linked domains of research into office space; of “property and real estate”, “facilities and workplace” and “business and performance”, moving from upstream to downstream in the delivery of workplace. The validity of such a distinction, is itself the result of the evolution of generalised commodities like “office buildings”, intended for future use by a variety of users, not yet identified, as distinct from the direct production of “bespoke” buildings by their users characteristic of pre-modern periods.

Haynes et al (2000) tell us how office buildings affect their occupiers. Three arenas of research are described: office developments as real estate, offices as facilities-managed workplaces and the operational parameters of the occupiers’ business performance. The first two can be considered the “supply” side, and the third the “consumer” side. Haynes et al (2000) point out however, that the three-arena model is merely a convenient way of articulating a boundary-less field. It nevertheless reflects the disciplinary segmentation of the fields in practice. **Figure 3** depicts these three arenas.

Figure 3 *The Three Arenas of Office Real Estate Research (from Haynes et al 2000)*



These arenas provide a useful template to address salient issues in real estate research that cut across two categories of issues in management decision-making involving property: strategic level issues and administrative or operational level issues. In this context a strategic decision is one that:

- has an effect of long duration
- is difficult to reverse
- affects a large number of organisational functions
- affects organisational values (Ackoff 1970 in Brown 2001).

Occupying a new building would fall into this category, whilst its design is likely to have profound administrative and operation impacts.

The property and real estate arena

The property and real estate arena is concerned with market responses to occupiers' changing requirements. This arena is where the design decisions for the building are made and where the value of property is observed.

Haynes et al (2000) observed the changing nature of the overall supply of office property in the market. They suggest that "the overall industry of investors, developers and valuers, may unwittingly conspire to conservatism and potential stagnation" (citing Gibson and Lizieri, 1999) and that "the feedback from the impact on the customer to the investment decision by the occupier does not seem to receive attention, perhaps because it is not understood" (2000 p9). Haynes et al (2000) also suggest "professional conservatism in valuation techniques may contribute, especially reliance on ad hoc market evidence".

The business arena

The business and performance arena is obviously affected by property and facilities, but how it does so, in what aspects, and to what extent is not well-addressed in the literature (Haynes et al 2000). However, there seems to be broad agreement that the importance of real estate's contribution to a company's business performance both strategically and operationally has in recent years overtaken the role of buildings as simply under-managed assets on the balance sheet (Haynes et al 2000; Brown 2001). Haynes et al (2000) argue that the performance of real estate is and should increasingly be measured by its effect on business performance as this may be the ultimate arbiter of whether an office building is delivering.

The facilities and workplace arena

The facilities and workplace arena is concerned with operational facilities management (FM) support and with the design, implementation and evaluation of new styles of offices. FM and workplace issues are important because they form the lens through which consumers (occupiers) experience the building. Facilities management plays a crucial role in ensuring that real estate's use value is fully utilised by the occupier by managing functional performance to counter obsolescence by enabling a higher "degree of match".

Tenants or occupier organisations in an office property are concerned that the building meets the specific requirements of their business operations. Investment institutions and developers, on the other hand are concerned with the cost of supplying building characteristics and the return on their investment. The return to these institutions is determined by market demand, embodied in rental value of the property (Bottom et al 1999).

Therefore two intertwined key issues for the determinants of office real estate value, but which also lie firmly within the realm of facilities management are:

- functional performance, "defined by the interactive relationship between the building and the occupier organisation, the measure of a building's functional performance being the degree of match between organisational requirements and building characteristics at a particular time" (Bottom et al 1999 p343) and

- obsolescence, which is contributed to by the lack of functional performance.

Value in office real estate

As discussed, “value” delivered is contingent on the preferences of the beneficiary. Thus the key to defining “value” in an office development is identifying the players who invest in, develop and occupy offices and their demands on and benefits they receive from the property. Haynes et al (2000) argue, however, that there is a misalignment between the three areas of property and real estate, facilities and workplace management and business and organisational performance. But to identify and manage the sources of value, the complex relationships between the three arenas must be understood.

The reason for the need to address these questions becomes clear when one considers the functioning of a market: if the consumers (occupiers) and their preferences are far removed from the suppliers (developers, mediated by facilities managers), it is unlikely that the market will operate efficiently, and therefore effectively. **Figure 4** depicts this market feedback process.

Figure 4 *The Occupiers’ property chain and feedback (from Haynes et al 2000)*



The nature of real estate and buildings do not help, particularly the long-term nature of investments and the need for a diverse body of specialist knowledge. Nevertheless, unless it can be demonstrated that the investment in “better design” within the real estate and property arena will be sufficiently valued by the parties “downstream” so that they are willing to reward the developers/investors for it, giving rise to greater returns on investment, then investment is unlikely to make economic sense. The assumption here, of course, is that better design requires a greater initial investment, something which may not always be the case (Carmona et al, 2001, p77).

Issues of real estate and business

Bottom et al (1999) discuss office buildings as both an investment medium and as a key element in the operations of an organisation. The key concern of owners is to continue providing the property product with characteristics that are desired by tenants. This requires techniques that help close the feedback loop between managerial action and property/investment performance. Baum (1993) notes that internal specification and configuration are the most important factors in combating rental depreciation.

Real estate as active assets

Historically, real estate has simply been a large part of an organisation’s fixed assets that were considered to underpin its liabilities to shareholders and debtors (i.e. an investment medium). In practice, corporate assets have historically been under-managed (Bottom et al 1999). This view has

been changing in both academia and practice and “shifting organisational requirements and changes in property values are forcing companies to manage operational property strategically” (Graham Bannock and Partners 1994, in Bottom et al 1999, p242).

Research in FM (Williams 1985; Sims 1996, in Brown 2001) shows that buildings are increasingly recognised as active assets requiring top managerial attention. However, the precise role and mechanisms of those real estate elements in the aiding the primary business processes (i.e. its operational role) have generally not been studied.

Administrative and operational roles of real estate

Property is a key factor of production in organisations. The variable nature of operational property requirements of organisations combined with largely static design characteristics of individual buildings influences the intangible functional returns and benefits to tenants. This is the focus of facilities management initiatives designed to maximise these benefits and to manage, assess and minimise the risk of depreciation caused by obsolescence as a result of poor “occupier fit”.

The design of offices parallel continual organisational changes “as workplaces need to be capable of responding to shifting organisational needs whilst being more finely tuned to specific requirements” (Laing, 1993; Harman-Vaughan, 1995, in Bottom et al 1999). However, “organisations... change at different times and rates” (Davis et al 1985; Becker and Sims 1990, in Bottom et al 1999). This precipitates important considerations linked to rates of aesthetic, functional and social obsolescence (see below).

Property and facilities management literature recognises the benefit of a holistic property information resource including detailed financial, physical and functional performance records (Becker, 1990; Noha, 1993; Joroff et al 1993, in Bottom et al 1999). These models help facilities management to address the potential mismatch between supply of and demand for office space, and to maximise functional performance:

- Cost allocation models help keep track of how every square foot of space is used.
- Space charging and standards provide approaches to manage space allocation: space standards are menus of standard work station or office footprints appropriate to different tasks; the alternative to which is space charging, for which Haynes et al (2000) have identified several modes of charging.
- Output specification and service level agreements help regulate and assess both hard and soft services delivered to occupiers.
- Occupier analyses study the satisfaction and behaviour of occupiers, including through the use of performance measures that record occupants’ behaviour and work performance, including productivity, as well as preferences concerning their environment.

The rapidly changing nature of business

The changing needs of business in a “post-fordist” economy, including challenges that arise from the complex “network of relational contracts within or around a firm”, and the new emphasis on “knowledge” as a distinctive factor of production seem to have largely been ignored by facilities

management research (Grimshaw 1999 in Haynes et al 2000). "New thinking in management does not yet find expression in the literature of property and space" (Haynes et al 2000 p7).

Commentary so far seems to indicate only a modest impact (of these changing demands on the actual supply of office real estate). More than 83% of businesses contacted in a 1997 survey (Gibson and Lizieri, 1998; 1999 in Haynes et al 2000) reported that their new business practices had not affected either the lease length or the location of their new offices. Some (ca. 30%) required reduced amounts of space but the bigger impact was on layout (Haynes et al 2000 p8). Because of this and because businesses were found not to be able to forecast space requirements beyond the short-term (3 years), the ability to exit had become a very important factor in decisions concerning new property (Gibson and Lizieri 1998 in Haynes 2000 et al).

Productivity as a proxy measure for good workplace performance

The assessment of productivity of an organisation is a common measure of business performance. However, it is not clear how to attribute productivity to workplace configuration. "A number of research establishments, consulting organisations and similar associations claim to know more than is published...." (Haynes et al 2000 p 23). Much assessment has been qualitative and case studies abound of both successes and failures of how building layouts have affected operations. Haynes et al (2000) argue that these may be more convincing evidence than "invisible" methods not in the public domain.

Strategic roles of real estate

Brown (2001) shows that some decisions regarding buildings should be regarded as strategic, not merely operational decisions, in particular where they concern "important new buildings" noting that Ackoff's criteria for identification of strategic decisions are always present in decisions regarding important new buildings (see above). He argues that the building design itself and design issues should be considered part of a company's strategic management, rather than its more usual place in administrative management.

Buildings are increasingly seen as the repository of a company's identity which is a strategic asset as well as a key operational factor. Brown (2001) suggests, therefore, that in theory, corporate strategy, real estate strategy and building design strategy should be related, but in practice, the relationships are distant. He argues for the harmonisation of these three areas of strategy, but also for the linking up of the administrative and strategic thinking about buildings.

Baum's (1993) description of types of depreciation also suggests that real estate requires a strategic management approach. He defines tenure-specific depreciation as a direct result of leases, tenancies and statutes that restrict or encumber an investment. He argues, however, that property-specific depreciation, affects property regardless of tenure. Despite this, there is still very little business literature linking measures of business success to real estate and facilities factors.

Organisational culture

A growing body of literature also examines how a building may affect the less easily quantified "organisational culture" of an occupier. Haynes et al (2000) discusses case-specific examples where

physical layout has played a direct role in affecting the way in which an organisation works. He suggests that key decisions at building and workplace design stage can impact on organisational culture and values, again placing these decisions in the “strategic” category.

Obsolescence

A building’s functional performance is defined by the interactive relationship between the building and the occupier organisation, the measure of a building’s functional performance being the degree of match between organisational requirements and building characteristics at a particular time. Given that organisational characteristics and functional performance may change, there is a risk of diminished returns to the investor. Where mismatch does occur, this results in obsolescence, which has been the topic of considerable research (Baum, 1991; 1993; Salway, 1986; Khalid, 1993; 1994; Bottom et al, 1997; 1998; 1999).

Haynes et al (2000) propose that there are three viewpoints from which literature has tended to view obsolescence: the first from a property valuation viewpoint (Baum, 1991; 1993), the second, from an occupier viewpoint (US Building Research Board, 1993), and the third in bringing together the first two, the most notable being that by Bottom et al (1997; 1999).

Baum (1993) goes as far as to define “building quality” simply as resistance to depreciation caused by obsolescence and physical deterioration. While such a narrow definition of building quality may ignore issues such as the impact of the building on its locality and its non-occupiers who encounter it, it nevertheless goes to the heart of building quality as salient to the real estate investor, where a quality building is one that retains its investment value.

Thus, Baum (1993) suggests that depreciation is the loss in the real existing use value of property as a result of two factors:

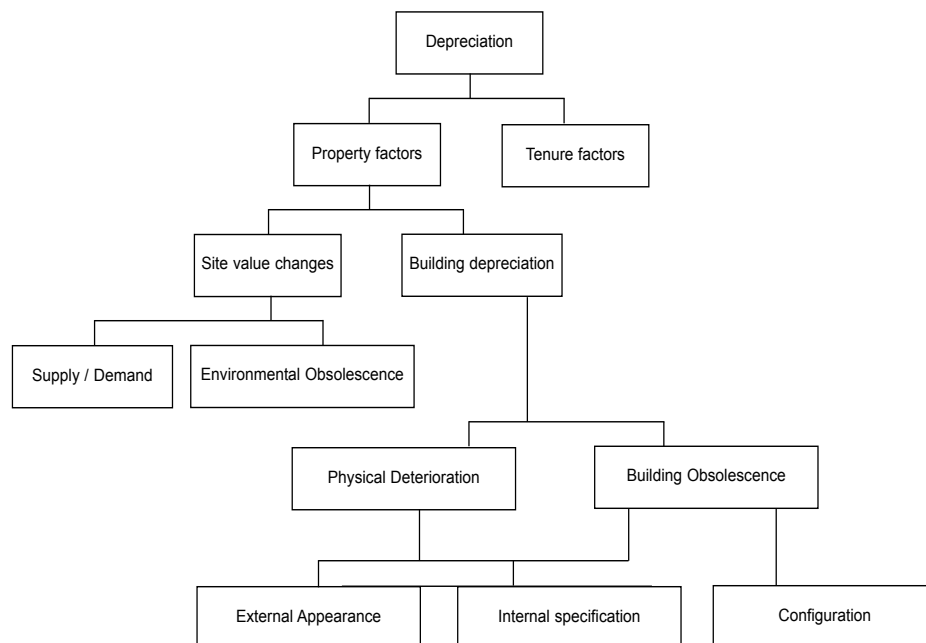
- Physical deterioration – of the built fabric as a function of use and action of the elements
- Building obsolescence – resulting in a value decline not directly related to use, action of the elements, or the passage of time. For example, obsolescence may be instantaneous as a result of technological advance resulting from change extraneous to the building in question.

Figure 5 and **Figure 6** show Baum’s classification of depreciation and obsolescence.

Figure 5 *Building Qualities (from Baum 1993 p37)*

Configuration	Plan layout
	Floor to ceiling height
Internal specification	Services
	Finishes
External appearance	Exterior
	Common parts
Durability of materials	Resistance to external deterioration
	Resistance to internal deterioration

Figure 6 A Classification of Depreciation and Obsolescence (from Baum 1993 p37)



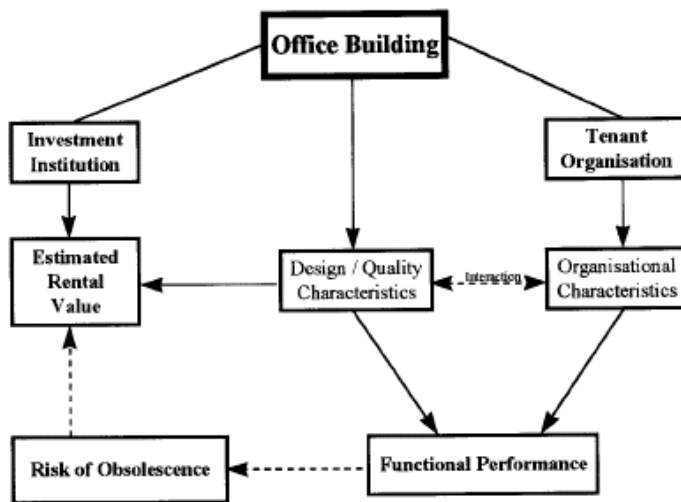
Baum (1993) describes four forms of building obsolescence (although the last two are a subset of the second):

- Aesthetic – results from an outdated appearance which is incompatible with corporate image or modern architectural style
- Functional – a product of technological progress which causes changes in occupiers' requirements, impinging upon both layout and facilities offered
- Legal – resulting from the introduction of new standards
- Social – resulting from increasing demands by occupiers for a controlled work environment and improved facilities.

Of the four types, three relate to the requirements of the tenant organisations which are influenced by forces extraneous to the building in question. Baum (1993) also makes the case that building qualities are more strongly correlated with, and are better explanations of depreciation than simple age.

Bottom, McGreal and Heaney (1999) developed and tested two models designed to identify the occurrence of obsolescence for facilities management purposes. Based on the evidence that building obsolescence and its relationship with depreciation within office investment portfolios is related to the changing characteristics and requirements of tenant organisations, building appraisal techniques are put forward as the correct tools to analyse characteristics of office properties in order to identify potentially obsolete characteristics. **Figure 7** illustrates the key relationships between building characteristics, occupier needs and characteristics and investment performance.

Figure 7 Theoretical Relationships in Office Real Estate and Facilities Management (from Bottom et al 1999 p343)



PART TWO: Summary and categorisation of literature

Types of studies

The review examined five broad types of studies, all of which are brought together in **Annex A**:

- Type A are those studies that attempt to set out the characteristics of a “high quality” building or high quality urban design, without necessarily prescribing methods to aid identification or evaluation of quality in the built environment. A range of aspects in the built environment are covered, from architectural and urban design, to environmental and post occupancy performance.
- Type B are those studies that prescribe ways of evaluating building quality, and in doing so, help make explicit aspects of quality or design that are not perceived outside narrow confines of the relevant body of professional knowledge.
- Type C are those that test whether or not there is any relationship between the presence of one or a series of component characteristics (such as design) of a good, service, resource or enterprise and the value placed on it by those to which that value accrues. This “valuation” is carried out using established methodologies and demonstrates, using a large sample, some relationship between one observed characteristic (as denoted by the independent variable of a regression analysis) and its impact on another (denoted by the dependent variable, which in this case, is exchange value). At its outset such studies can only make assumptions about how these characteristics are “picked up” by the valuer (a black box, after Levy and Schuck 1999), but the results shed further light on what may be going on within that “black box” by allowing observation of change in some variables (dependent variable / input to black box) when there is change in other variables (independent variable / output from black box).
- Type D comprises those studies that focus on uncovering what is in that “black box”. Some of these studies set out to examine in detail the forces and causes of particular patterns that are observed around the black box.
- Type E comprises propositional studies that deal with new methodologies by which monetary value may be derived and described. The latter provide, in effect, new mechanisms to place within the space occupied by the “black box”. These may or may not have so far been tested for their serviceability to reflect a “useful” valuation in practice.

Type A: Conceptualisations of design

In this section, a highly selective review of the range of design conceptualisations is provided, as a full and detailed review is not within the remit of this paper. These types of study nevertheless serve to illustrate a range of approaches to describing quality in built environment outcomes, whether of architectural design, urban design or environmental design.

Some fundamental qualities

The most basic relate to the fundamental qualities of architecture and urban design. These conceptualisations are in the same mould as those already discussed in Part One above and are more of less reductionist in nature.

Probably the most famous conceptualisation of architectural design characteristics is Vitruvius' broad but axiomatic dimensions: "commodity, firmness and delight". Given their vintage and generality, these dimensions are often referred to as the basis of many more specific lists, such as within the Design Quality Indicators (DQIs) developed by the Construction Industry Council (see below). By themselves, however, they are too general to be useful in direct application to design assessment, although each dimension might be broken down further.

Hillier, Musgrove and O'Sullivan's (1972, in MacMillan 2004) 'Four-function Model' does this by focussing largely on the 'commodity' dimension, and in so doing providing a particular perspective on architectural design. Thus buildings can be viewed for their role as:

- Climate modifiers: a complex environmental filter between inside and outside
- Behaviour modifiers: that both inhibits and facilitates activities
- Cultural modifiers: symbolic and cultural objects
- Resource modifiers: an addition of value to raw materials and a capital investment.

This is a useful conceptualisation of building characteristics as it attempts to capture and classify all of a building's effects, many of which are likely to have a direct and profound impact on market value. In this regard the functions are mainly "private" in their impact, or rather their impact is primarily felt by building occupiers/users and owners.

Conceptualisations of urban design, by contrast, tend to be mostly "public" in their orientation (eg. functional and social use, natural environment and sustainability, visual, the urban experience – Property Council of Australia 1999). Carmona et al (2002), bring together the various "national" conceptualisations of urban design in seven broad categories (**Figure 8**), each of which show the range of fundamental concerns that new buildings will have an impact upon beyond the confines of their immediate skin and structure.

Figure 8 National design conceptualisations

	Towards an Urban Renaissance (1999)	By Design, Urban Design in the Planning System (2000)	Urban Design Compendium (2000)	Better Places to Live, A Companion to PPG3 (2001)
Sustainable urban design	<ul style="list-style-type: none"> • building to last • sustainable buildings • environmental responsibility 	<ul style="list-style-type: none"> • adaptability 	<ul style="list-style-type: none"> • manage the investment • design for change 	<ul style="list-style-type: none"> • adaptability • maintenance • sustainability
Townscape	<ul style="list-style-type: none"> • context, scale and character 	<ul style="list-style-type: none"> • character 	<ul style="list-style-type: none"> • work with the landscape 	<ul style="list-style-type: none"> • Structure • detail
Urban form	<ul style="list-style-type: none"> • optimising land use and density 	<ul style="list-style-type: none"> • continuity and enclosure 	<ul style="list-style-type: none"> • mix forms 	<ul style="list-style-type: none"> • space
Public realm	<ul style="list-style-type: none"> ▪ public realm 	<ul style="list-style-type: none"> • quality of the public realm • legibility 	<ul style="list-style-type: none"> • places for people 	<ul style="list-style-type: none"> • parking • safety
Mixed use and tenure	<ul style="list-style-type: none"> • mixing activities • mixing tenures 	<ul style="list-style-type: none"> • diversity 	<ul style="list-style-type: none"> • mix uses 	<ul style="list-style-type: none"> • mix • amenity • community
Connection and movement	<ul style="list-style-type: none"> • access and permeability 	<ul style="list-style-type: none"> • ease of movement 	<ul style="list-style-type: none"> • make connections 	<ul style="list-style-type: none"> • movement • layout
Application to context	<ul style="list-style-type: none"> • site and setting 	<ul style="list-style-type: none"> • (application through eight aspects of urban form) 	<ul style="list-style-type: none"> • enrich the existing 	<ul style="list-style-type: none"> • place

It is notable, that only the 'Urban Design Compendium' included any direct reference to the economic/investment dimension of design.

Design and office developments

For the majority of office developments, the building will be just one contribution to these broader urban design qualities, whilst only in the minority of large scale new campus/urban quarter developments will these qualities be created in the round.

Narrowing the scope to conceptualisations to the design of office buildings, and specifically to their performance from a real estate point of view, Baum (1993) proposed a narrow property-based conceptualisation of building quality, which, in the case of property "may be defined as the resistance of a building to physical deterioration (interior and exterior) and resistance to obsolescence" (Baum 1993, p31). These dimensions relate to the requirements of the tenant organisations that are influenced by forces extraneous to the building in question. Defined in such a bounded and narrow way, quality is inextricably linked to property performance.

Bottom et al (1999) provide possibly the most thorough list of dimensions that describe the functional performance of office buildings (defined as the “degree of match between organisational requirements and building characteristics at a particular time”). In the course of their experiments, they derived 39 design factors that describe critical areas of organisational interaction (for example corporate expectations) and direct measurements of design attributes (for example a presentation score for external walls, doors and windows). 37 relate directly to the building, two to location, and all can be grouped under seven headings:

1. Structure and Enclosure
2. Building Services
3. Building Shell / Common Space
4. Common Access and Circulation
5. Location
6. Amenities
7. Tenants’ Work Environment

While these are thorough in addressing traditional real estate concerns, and therefore include some very fundamental design elements, they understandably do not address urban design public benefit issues. Thus the value captured by these elements, accrue only to those who have a stake in the property.

A multi-constituency approach

Guy’s (1998) proposed five “logics” of design innovation systems are in effect value systems that motivate different stakeholders to act within a generic development scenario to arrive at particular design decisions. The five “logics” of innovation each relate to a different form of environmental value, and emanate from distinct sources of environmental concern. They are:

- Community logic – emphasises socially cohesive design
- Comfort logic – encourages design that promotes good health
- Aesthetic logic – expresses a new attitude to nature
- Smart logic – maximisation of the efficient use of resources
- Ecological logic – minimise the environmental footprint of the building.

The notion that these are “logics” of decision making rather than “characteristics” of the desired product marks a fundamental paradigm shift from the different “dimensions” as characteristics of physical configurations. The “logics” inherently recognise the multiple stakeholders in the design process and therefore addresses the “Why is this product like this?” question, whereas the “dimensions” approach stops at “What is the product like?”.

These logics may “collide, merge or co-inhabit debate about form, design and specification” (Guy 1998, p16); thus in this conceptualisation multi-constituency is built in. DQIs also reflect this notion. Thus different assessors evaluate the performance of a building against a wide spectrum of attributes collected under three main headings: functionality, build quality, and impact (see below).

DQI represents a seminal attempt at a rounded assessment of building quality because, like Guy's (1998) notion of "logics", it puts stakeholders at its heart through the different weightings they give to the elements included within the model. The DQI provides a detailed methodology for evaluation, communicating and translating design assessments, and therefore moves beyond a mere checklist. It is envisaged that the tool will become more a means to facilitate constructive discussion about building quality and less about scoring points.

Selection of dimensions

The different design dimensions reviewed above demonstrate some of the ways in which sets of dimensions are selected to fulfil various descriptive, prescriptive or evaluative functions. They reflect something of the wide range of "design quality" aspirations held by different stakeholders. The choice of dimensions must enable the intended judgement to be made and will therefore be selected to be practical and useful for that purpose.

Dimensions selected by the function or effect of design on the building

Hillier et al's (1972) four-function model and Guy's five-logic model both set out dimensions in order to describe the generic key areas in which a building or a built environment intervention will have an impact. They pose the important question: "Will the design deliver the ultimate objectives of the party that commissioned it; be that providing optimum comfort, allowing particular activities to occur, to act as a landmark building for an organisation, or to generate returns for investors?"

What is notable is that these two studies, twenty-six years apart, echo similar fundamentals about the impact of a building and the "value", both private and public, of that impact. It is possible to compare the two lists as follows:

- Community logic – Behaviour modifier
- Comfort logic – Climate modifier
- Aesthetic logic – Cultural modifier
- Smart logic – Resource modifier
- Ecological logic – this could conceivably be linked to a building as a "climate modifier" in that buildings have a "displacement effect on external climate and ecology". Notably, singling it out in the second study may reflect the much greater concern placed on ecological concerns in 1998.

Dimensions selection by scope of professional knowledge domain

Both the categorisations in the range of urban design conceptualisations (**Figure 8**) and Baum's definition of building quality as "resistance to obsolescence" reflect the narrowing down of the scope of design quality, in each case to reflect concerns associated with particular professional groups; in these cases urban designers and real estate valuers.

Other lists of dimensions reviewed under Type B studies (below), such as those for Post Occupancy Evaluation (facilities managers), or for BREEAM (building services engineers), also reflect a focused area of concern by a profession. As Macmillan (2004, p7) observes, "Buildings have diverse impacts – ranging from civic pride to occupant comfort. These are all design issues, but only rarely are they

discussed at one and the same time. We seem to decompose the built environment by discipline". In each case, quality is both defined and perceived differently.

Self-selected and weighted dimensions to take into account multiple stakeholders

Finally, the Design Quality Indicator (DQI) is important, not because of the particular dimensions it deploys but because of the way in which the dimensions are weighted by the various stakeholders themselves during the operation of the tool. This goes some way to addressing the dilemma of multi-constituency, if not by solving it, then at least by articulating and representing it.

This issue arises because a building is a very large physical object, they are physically immobile and they contain people and processes (Brown 2001). Buildings are also ubiquitous, and on the part of users, interaction with particular buildings is not always voluntary. Thus a building needs to satisfy the functional needs of many different people at the same time, and planners, local politicians, the public and architects all have very different perceptions of architectural design"(Jeffrey and Reynolds, 1999).

Type B: Studies that assess building characteristics

These studies take as their starting point attempts to conceptualise, then to describe design, the results of which become the basis of data collection to which a value may eventually be ascribed. Some also propose methods and techniques that help the interpretation of data gathered through observation into a different, perhaps more universal language: that of value.

These methods may or may not resort to the use of "dimensions" to describe the scope of evaluation. The methods tend to encompass Elements 1 (observation) and 2 (assessment) of the conceptual framework for valuation (**Figure 1**). Some methods also include Element 3 (translation).

Each will be examined for the following:

- its methods and techniques used to observe characteristics of a design, if these are separate from those used to evaluate
- its methods and techniques used to evaluate characteristics of a design.
- its methods and techniques used to communicate and thus translate characteristics of a "design" into other forms of value
- the purpose of each tool, i.e. any political motivations or bias behind the chosen dimensions, and the background of the author, which may shed light on why particular dimensions have been selected.

The purpose of a method/tool and those who have commissioned it is likely to be extremely influential on its design. Fundamentally, however, all evaluation tools are about collecting raw data on particular aspects of an entity or a phenomenon and translating into a form by which it can be compared with other data. Comparison for the purposes of managing change or improvement (as opposed to simple political headlines) is likely to need technical detail, so that appropriate solutions may be designed.

Assessment tools

A selection of building or urban design assessment methodologies were therefore reviewed, chosen to illustrate the range of reasons for assessment and more importantly the techniques of assessment employed:

- The Design Quality Indicator (2002) – construction and architectural design biased
- The BREEAM (Building Research Establishment Environmental Assessment Methodology) – environmental quality biased
- Post Occupancy Evaluation (POE) and PROBE – occupant biased.
- Housing Quality Indicators (1999) – deals only with one building type.
- Design competition / knowledge platforms in architectural design (method of assessment) (Brown 2001) – reviews non-benchmarked methods of assessment.
- Urban Design Appraisal Tool (CABE, 2001) – rating system for urban design
- Space Syntax (Desyllas, 1999) – assesses characteristics of urban morphology.

DQIs

The Design Quality Indicator (DQI) has already been discussed above, and applies an established social science approach of self-weighted dimensions to the design of buildings. This takes into account these multiple demands for value exerted over a building and therefore, if used with a suitable balance of participants, can remove “disciplinary-linked” bias over conceptions of design quality.

While not explicitly a tool for translating design quality into monetary value, the DQI nevertheless stretches a long way from Element 1 towards Element 4 in Figure 1. In particular it is able to translate design quality into a graphic form, which is then easily communicated. Perhaps most significantly DQIs represent a sophisticated attempt to rationalise even the most ‘subjective’ of design considerations and to balance these and the full range of design concerns against other (seemingly more objective) design, development and construction factors.

Developed by the Construction Industry Council to evaluate the design quality of buildings, DQIs are administered as a short questionnaire which can be followed by a workshop at which the responses are discussed. It also allows a comparison of responses between different stakeholders.

In order to define architectural quality, the tool returns to the Vitruvian principles of commodity (fitness for purpose), firmness (soundly built and durable), and delight (pleasing to the eye and the mind), recasting the principles as:

- Functionality – use, access, space
- Build Quality – form and materials, internal environment, urban and social integration, character and innovation
- Impact – performance, engineering systems, construction.

These basic principles are subsequently broken down into a series of sub-principles and related to a 'resource envelope' defined by time, finance, context and other resources (including human) in a conceptual framework that establishes degrees of quality:

- Basic quality – where the three principles fail to overlap
- Added value – where two of the principles overlap
- Excellence – where all three principles overlap to deliver optimum design solutions.

The final toolkit will take the form of a computer programme in three parts. First, the DQI concept itself with the tripartite conceptualisation of quality suitably broken down into related sub-criteria. Thus, for example, character and innovation is broken down into security, spirit raising, visitors like, organisational image, acclaimed, character, makes you think, clear vision, and develops new knowledge. Second, a data collection tool, in which the sub-criteria can be scored on a scale from 1-6 (7 for not applicable/don't know). Finally, a weighting algorithm, which allows users to weight the relative importance of the various sub-criteria in each of the three categories of quality, and the importance of the main categories themselves.

The results are presented both as an overall score, but more importantly in the form of a spider diagram in which all of the sub-criteria are related to the quality thresholds already established.

BREEAM

This is a tool for analysing the environmental performance of buildings. It can be used as:

- a property specification tool
- a design tool
- an environmental review tool within environmental management strategies.

Assessment is carried out by a network of registered assessors, indicating that the tool's designers recognise that assessing various sustainability issues involves subjective judgements about their relative importance.

The BREEAM uses the concept of an Ecopoint, where 1 ecopoint equals, among other things:

- 320kWh electricity
- 83m² water: enough to fill 1000 baths
- 65 miles by articulated truck
- landfilling 1.3 tonnes of waste
- Manufacturing 250 bricks.

The concept of an ecopoint acts as a "currency" by which the costs and consequences of making particular design decisions are easily apparent to non-experts or professionals outside the immediate field of environmental design.

Based on the ecopoint system, “envest”, a design tool has been developed to allow comparison of different buildings for different reasons:

- As a design-decision support tool, by helping to optimise form or to choose particular construction methods
- As a predictive modelling tool to balance environmental impacts of construction and operation over the whole life of building.

The assessment tool allows comparison either against other buildings or as an illustration of sustainability credentials. The ecopoint is a form of translation from technical to layman’s terms. It can also be easily translated into monetary values. Research has also investigated whether the BREEAM process can be extended to include the visual architectural and urban design (Uzzell & Jones, 2000). The researchers concluded that although these issues could be assessed, they would need to be considered in a “process” way (i.e. in what way, if appropriate, has the designer considered these issues) rather than in the form of a “product-based” checklist. So far, this has not been introduced.

POE and PROBE

Post Occupancy Evaluation (POE) can be defined as “examinations of the effectiveness for human users of occupied designed environments” (Zimring and Reizenstein, 1980 in Zimmerman and Martin 2001, p168) and represents “a process of systematically evaluating the performance of buildings after they have been built and occupied for some time” (Preiser 2002, p42). Today POE is becoming “part of the mainstream ‘kit of tools’ architects and designers can avail themselves of” (Preiser 2002 p43). POE:

- Provides a means to combine the assessment of the physical condition of the building and its systems with assessment of user comfort on topics such as indoor air quality and ventilation rates, and lighting levels
- Helps ensure that building occupants’ needs are assessed, including health, safety, security, functionality and efficiency, psychological comfort, aesthetic quality, and satisfaction.
- Makes the built environment process more scientific and research-orientated
- Can be seen as a logical final “feedback” step of a cyclical design process.

POE is also evolving into a process-oriented evaluation method for planning, programming, and capital asset management. PROBE, for example, is perhaps the seminal exercise in benchmarking using POE techniques, through its utilisation of a web-based building occupant questionnaire. PROBE can help with evaluation, briefing and diagnostics, using 45 variables relating to:

- comfort
- health
- productivity
- perceived control.

HQIs

Housing Quality Indicators (HQIs) were commissioned from the DETR and Housing Corporation (1999) and provides a methodology for assessing the quality of potential (or existing) housing schemes. Initially the aim has been to create a tool to build into the procedure of assessing possible projects for public funding. By this means it is hoped that quality will become an explicit component of the assessment process alongside price. In the long-term the aim is to provide a flexible tool for use in both the public and private sectors to measure housing quality for new and existing stock.

The system allows an assessment of quality to be made on the basis of three main categories, location, design and performance. These further break down into ten 'Quality Indicators'. Schemes are scored against a wide range of sub-criteria in each category and a percentage is calculated overall and for each indicator, which are then weighted according to the user objectives. Thus a single number provides a headline score for each scheme, although the emphasis is on 'quality profiles' that show the strengths and weaknesses of each scheme.

In this respect the concept of a range of quality is adopted for each aspect of quality, including for more subjective aspects such as aesthetics. The final choice of indicators therefore reflects a compromise between the importance of the issue to quality, practicality of use, and the information available.

Design competitions

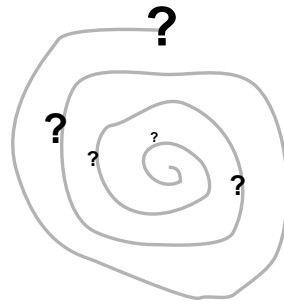
Brown (2001) discusses design evaluation in the context of building design competitions for major corporate real estate decisions. He conceptualises the complex processes of design and how this helps us evaluate the design result, and argues that "The main way of testing a design as though it were a hypothesis is by a process of comparison..." (Brown 2001 p97). "Hillier, Musgrove and O'Sullivan (1972) proposed something similar, that a design should be considered the equivalent of a conjecture about how a building's form can be used and that such conjectures (or hypotheses) could be fully tested (Hillier and Leaman 1974).

Inherent in this conjecture-test model is the recognition that designs can be tested. Evaluation therefore simply reverses the basic elements of the design process" (Brown 1999 p97). Thus, we start with the design and compare it with appropriate "knowledge fields", and perhaps with an existing building. There are no statistical tests in this model with which to evaluate design because, for advocates for the approach, the analysis-synthesis model of a rational design machine (as discussed earlier i.e. DQIs and HQIs), fails to adequately reflect the complexity of the design process.

In order to understand the evaluation by reversal of the design process, however, one must first understand the design process itself. Brown, for example, has argued that the analysis-synthesis linear model cannot describe the way buildings are designed. Instead, design is an "intricate intellectual process" that is "the translation of a series of verbal symbols, arranged in analytical, syntactical time order, into an organisation of concrete materials, and shapes, and colours, all existing simultaneously in a three dimensional space" (Ivins 1969, in Brown 2001 p94).

Brown, after Hillier et al (1972), describes the design process as one of variety reduction because there are usually a large number of solutions to a design problem, although only one is built; a process of variety-reduction therefore takes place that has excluded the unexecuted design possibilities. This is achieved through an iterative, cyclic approach, spiralling in as uncertainty and variety are reduced regardless of the source of the design knowledge” (Brown 2001 p94) - see **Figure 9**.

Figure 9 *The design process as iterative variety reduction (from Brown 2001 p95)*



Brown notes that “the problem of evaluating an innovative building design based on designer codes (which are an architect’s theories, values and tacit knowledge) is that, for practical purposes, they are a black box, and they are not widely available” (Brown 2001 p97). This suggests that to evaluate design, it is necessary to choose other designs as the basis of comparison, rather than standardised benchmarks of some sort as these are too simplistic. In theory at least, the greater the number and diversity of judges on a competition panel, and the greater the number of proposals reviewed, the more likely that some optimal solution will be selected, and the less personal bias will affect the final evaluative decision.

Urban design appraisal tool

This tool was suggested in CABE (2001), drawing on an understanding of the available tools for evaluating urban design and covering the widely accepted objectives of urban design supported in 'By Design'. The analytical tool is presented in **Figure 10**.

Figure 10 Urban Design Analytical Tool (from CABE, 2001)

Case Study Assessor Occupation				
Urban Design Objectives	Performance Criteria	Strengths	Weaknesses	Evaluation 0 = not at all successful 5 = very successful
1 Character	a distinct sense of place responding to local context			0 1 2 3 4 5
2 Continuity and Enclosure	clearly defined, coherent, well enclosed public space			0 1 2 3 4 5
3 Quality of the Public Realm	safe, attractive and functional public space			0 1 2 3 4 5
4 Ease of Movement	an accessible, well connected, pedestrian friendly environment			0 1 2 3 4 5
5 Legibility	a readily understandable, easily navigable environment			0 1 2 3 4 5
6 Adaptability	flexible and adaptable public and private environments			0 1 2 3 4 5
7 Diversity	a varied environment offering a range of uses and experiences			0 1 2 3 4 5
Summary:				Total Rating

Note: For success, developments should rate well on all counts, although the total rating - out of 35 - provides some indication of overall urban design quality.

Instead of seeking a set of qualities as the outcome of the analysis, a set of answers to seven performance related questions were sought. These were placed, first, against a qualitative assessment of the strengths and weaknesses of the development regarding each urban design objective, and second, against a numerical evaluation of the success of the development in meeting the objective in question on a scale from 0 to 5 (0 suggesting that the criteria had not been met at all and 5 that they had been met very successfully). The qualitative aspect allows some, although limited, degree of comparison that Brown (2001) suggested was necessary for design evaluation.

Because of its simplicity, the tool can be used either by a trained assessor or by the range of stakeholders associated with a particular development in order to measure its success.

Space syntax

Desyllas' (1999) work on the relationship between office rent levels and characteristics of the urban street network is reviewed in **Annex A** and under Type C: "Studies that link design characteristics of the built environment to value". This study uses the "space syntax" approach to evaluate the street network.

Developed by Bill Hillier (Hillier and Hanson 1984; Hillier 1996 in Desyllas 1999), "space syntax" is an approach to examining urban morphology that is based on the theory that pedestrian movement is goal oriented towards simplicity. The "axial map technique" aims to "reduce" a movement system (such as an urban street network) to a pure spatial structure, which is represented as a "graph"¹. The axial map is drawn according to prescribed rules and leaves little room for personal interpretation. Simplicity is defined in terms "of the route requiring the fewest navigational instructions through the topology of the street network (rather than the shortest path in metric terms).

Since a high level of correlation is to be found between such measures and pedestrian movement patterns, this approach can be applied in order to predict the pedestrian movement pattern for a particular street network. Thus a measure of "integration" (see Desyllas 1999 p194) of a point on the axial map is basically a measure of accessibility of that point within a dense urban network.

Application to the conceptual framework

Review of element 1 across these selected studies: Observation and data collection

The two key issues here are whether the aspect of assessment (and hence the data) tends to be subjective or objective, and whether the data collection method is prescriptive or not. Of the building / design evaluation methods reviewed here, all require some form of judgement. In some cases, judgement needs to be made by trained individuals with skills and experience, for example, some elements of the DQI and the urban design appraisal tool, which require trained observers. In others, judgement is required of space or building users, who are surveyed for their preferences, for example, the POE. Apart from the "design competition evaluation" method, all are designed to reduce subjectivity, with varying degrees of success.

Figure 11 sets out the comparison of these tools, and the relationship between objectivity and prescriptiveness. These show that subjective aspects are dealt with either with a non-prescriptive data collection method (the architectural competition) or a semi-prescriptive method where dimensions are used to focus evaluation on certain crucial aspects. By contrast, both the studies dealing with more or less objective aspects utilise a very prescriptive data collection method (axial map technique and BREEAM).

This issue of observation and data collection for valuation has been studied in the behavioural approaches to property valuation, in particular in work by Diaz and Hansz (1997) and by Levy and Schuck (1999) that examines how valuer's value judgements are formed. Work by Hardin (1999), with

¹ "A graph is a map of pure relations... in which elements (or nodes) have no attributes apart from being connected to others... (therefore) graphs measure 'extrinsic' or non-local properties of elements" Hillier 1999 in Desyllas 1999)

reference to the use of heuristics also throws light on possible approaches of understanding this element that examines conceptual shortcuts used by each professional when dealing with issues they are trained in, as opposed to those issues that are peripheral to their knowledge domain.

Figure 11 Summary of Type B studies

	<i>DQI</i>	<i>The BREEAM (BRE environmental assessment method)</i>	<i>Post Occupancy Evaluation (POE) and PROBE (occupier)</i>	<i>Housing Quality Indicators</i>	<i>Architectural Design competitions</i>	<i>Urban Design Analytical Tool</i>	<i>Space Syntax approach</i>
Focus of Appraisal	evaluate the design quality of buildings	environmental performance of buildings	examinations of the effectiveness for human users of occupied designed environments	To assess the quality of housing schemes for public funding and provide a means to compare different schemes for the same site against a fixed brief	To assess “architectural” design merit	Simple assessment of urban design characteristics against ordinal criteria	Accessibility of a point in a dense urban network
Nature of Approach	Semi-prescriptive Subjective	Prescriptive Objective	Semi-prescriptive Subjective	Semi-prescriptive Subjective and Objective	Not prescriptive Subjective	Semi-prescriptive Subjective	Prescriptive Objective

Review of element 2 across these selected studies: Evaluation and comparison

Evaluation implies comparison with some standard or criteria, where a criterion is “a standard or principle on which to base a judgement”. In this context, a “standard” implies some measure that can be used as a “baseline” for purposes of comparison and therefore offers some objective comparative level.

Evaluation and comparison behaviour of decision-making across the spectrum of criteria has been the subject of much social science research into the design of survey tools, as well as the behaviourist approach to decision-making discussed earlier. Of the tools reviewed, only the design competition method does not use predefined standards against which to facilitate comparison.

Review of element 3 across these selected studies: Communication and translation

The format and media of communication of building or design appraisal results depends on the nature of the information, and that is in turn dependent on what aspect of the building or design is being appraised. In most appraisals where the scope of aspects being appraised is narrow (for example, urban morphology, or building environmental performance only), there are established ways in which the results are communicated. These formats are comprehensible by those trained within the relevant fields.

In recent years, much effort has gone into designing communication tools that allow the different specialist professions to communicate fully the more profound impacts of their profession-specific observation. Tools like the DQI and the HQI for example, use the universal language of numbers on a scale to communicate the “goodness” and “badness” of a particular design. The DQI goes further in depicting results in a spider diagram, which is highly intuitive, and which a lay person can understand. However, although these “levelling” devices communicate the “shape” of the evaluation data very well, they tend not to communicate “definition” well; in other words they are good as headlines, but do not provide the small print.

Type C: Studies that link design characteristics of the built environment to value

This section focuses on some important attempts to make explicit the value of design characteristics of buildings. The studies examined in detail are:

- Hough and Kratz 1983 – “Can ‘good’ architecture meet the market test?”
- Vandell and Lane 1989 – The Economics of Architecture and Urban Design: Some Preliminary Findings
- Doiron, Shilling and Sirmans 1992 – Do market rents reflect the value of special building features? The case of office atriums
- Baum 1993 – Quality and Property Performance
- Bottom, McGreal and Heaney 1999 – Appraising the functional performance characteristics of office buildings
- Desyllas 1999 – The relationship between urban street configuration and office rent patterns in Berlin

These studies have a wide range of related but different objectives, and thus ask a range of related but different questions about the relationship between a physical configuration or condition (e.g. design or building quality or street configuration) and value. They also employ various methodologies in answering these questions, drawing on different data sources in different ways. However, they all link “design” or “building quality” with “value” through inferring relationships over a large sample. **Figure 12** summarises and compares some of these studies.

Figure 12 Comparison of Type C Studies

	Hough and Kratz (1983)	Vandell and Lane (1989)	Doiron, Shillings and Sirmans (1992)	Baum (1993)	Bottom, McGreal and Heaney (1999)	Desyllas (1999)
Objective of the study	to determine if the value of “good” architecture) has been internalised by tenants or owners of commercial buildings	to evaluate empirically the nature of the contribution of architectural quality to the value of office buildings	To uncover any relationship between atrium presence / configuration and rental values.	Considers whether, and if so how quality in property development (excluding site issues) is likely to lead to high returns: quality and profit.	To establish that user-based performance data can be modelled effectively	To investigate the role of street layout on office rents for the particular case of reunified Berlin
What are the questions asked by this study?	1. Can “the positive externality of ‘good’ architecture be internalized; in particular, is the value of ‘good’ architecture reflected in the rental rates of commercial office structures?” 2. “whether or not tenants of office buildings appreciate the architectural quality of their spaces and thus are willing to pay higher rents for architecturally distinguished buildings.”	1. What is good design? 2. Does good design cost more? 3. Does it produce higher rents? 4. Does it result in faster lease-up? 5. Is it more profitable?	1. “whether market rents reflect the value of special amenities like atriums.” 2. “what is the optimum combination of leasable square footage and atrium space in order to maximise profit.” 3. Do developers add atrium space to a building design to a point where the implicit rent per square foot of additional atrium space equals the foregone cost of leasing additional space?	1. What is quality? 2. How does construction cost relate to quality? 3. How can quality and total return be related? 4. What other factors are relevant?	1. What is the relationship between design / quality characteristics and rental value? 2. What is the relationship between design / quality characteristics and functional performance? 3. What is the relationship between functional performance and rental value? 4. How are these relationships perceived by various stakeholders, i.e. building tenants of different organisation types and building owners?	1. How much does a tenant pay for location as distinct from other factors? 2. What does the pattern of location rents look like? 3. What spatial variables can explain the pattern of office rents?
Definition of design or building quality	A public good and defined as an “aesthetic” quality	Aesthetic amenity	Presence and size of special design feature (atrium)	Resistance to obsolescence	Building / Design quality (as defined by the 19 independent variables)	N/A. Instead the definition of the quality of a location is defined using a “space syntax” measure called “global integration”.
Benchmarks of good design / Comparator mechanism	Design award win as benchmark of quality	Judgement made by architects through postal close-ended questionnaire requesting a rating of 8 aesthetic dimensions of design plus overall design rating	Size of atrium only	N/A	A combination of: Building occupants’ opinions Experts for technical aspects	The “global integration” of a particular location (disaggregated only to the level of a street).
Sample size	139	Over 100	60 Class A and B office buildings in a similar location	N/A		412 office leases from Berlin between 1991 and 1997

Mechanism to link dependent to independent variables	Hedonic price regression	Hedonic price regression	Hedonic price regression	Opinion of experts at seminar	Tests the predictive accuracy of both regression analysis and an analytical neural network	Multiple regression analysis
Dependent variable(s) OR Indicator(s) of value	"average annual rent per square foot"	<ul style="list-style-type: none"> Costs Rents Vacancy rates 	actual rental values	N/A	<p>"Values" of functional performance values based on aspects of building / design quality:</p> <ul style="list-style-type: none"> Structure and Enclosure Building Services Building Shell Common Spaces Common Access and Circulation Location Amenities Tenants' Work Environment <p>An eighth to provide comparison:</p> <ul style="list-style-type: none"> Estimated Rental Value (ERV) 	Location rent (reflects the rent due to the location variable only; this is based on achieved rents adjusted to take into account inducements and rent free periods.)
Independent variables	<p>14 variables under 6 headings:</p> <ul style="list-style-type: none"> Distance from the centre of the CBD Distance from commuting centres (transport) Building responsiveness Amenities Disamenities Quality of architecture (aesthetic) 	<ul style="list-style-type: none"> Quality of materials used in the exterior skin Fenestration: composition and scale of the façade Massing: compositional bulk and volumetrics of the building Design of interior public space design of lobby plus other interior public space View of skyline: as seen from a distance Design of exterior public spaces Responsiveness to neighbourhood: relationship to abutting uses Provision of public amenities Design quality of the original building (prior to renovation) Quality of the rehabilitation Appropriateness of the renovation to the original structure Distance to city centre Availability of parking on-site Number of parking spaces within 800 feet of the structure Age of the building Gross square footage of the building Number of floors Whether or not the building has been rehabilitated Date of rehabilitation 	<ul style="list-style-type: none"> Lease-specific factors Market condition factors Location factors 	<ol style="list-style-type: none"> configuration (plan layout, floor to ceiling height) Internal specification (services and finishes) External appearance (exterior and common parts) Durability of materials (resistance to external and internal deterioration) 	<ol style="list-style-type: none"> Net internal floor area of tenant unit Age of the building Number of years since last large renovation Percentage floor space per employee Number of years since last renovation Percentage of floor space per employee Number of floors occupied Quality of presentation of building exterior Heating control and adjustability; mechanical ventilation control and adjustability; flexibility of power and IT outlets; power supply stability Centralized or decentralized HVAC system(s) Wet or dry HVAC system(s) Identity of main entrance; draught exclusion Reception / foyer provisions Area of reception space Floor to ceiling height in reception Volume of reception space Distance from entrance to lifts/ stairs Presentation of common space finishes Total width of all entrances 	<p>Spatial variables:</p> <ul style="list-style-type: none"> Space syntax measures <p>Non-spatial variables:</p> <ul style="list-style-type: none"> Time Building quality Lease provisions
Objective of the study	to determine if the value of "good" architecture has been internalised by tenants or owners of commercial buildings	to evaluate empirically the nature of the contribution of architectural quality to the value of office buildings	To uncover any relationship between atrium presence / configuration and rental values.	Considers whether, and if so how quality in property development (excluding site issues) is likely to lead to high returns: quality and profit.	To establish that user-based performance data can be modelled effectively	To investigate the role of street layout on office rents for the particular case of reunified Berlin

The diversity of questions asked by these studies ensures that together, they cover quite a range of aspects of the relationship between built environment characteristics and property value, although the overlapping of terminology results in a conflation of concepts being addressed in any one question. "Design quality", "building quality" and "value" have all also been interpreted to mean quite different things by the various researchers, and the studies reviewed all take a slightly different combination of the various terms, so that none of the studies are actually directly comparable. For example:

- "design quality" has been taken to mean "aesthetics" (Vandell and Lane 1989, Hough and Kratz 1983), "winners of architectural awards" (Hough and Kratz 1983), that which enables "functional performance" (Bottom et al 1999)
- "building quality" has been taken to mean "resistance to obsolescence" (Baum 1993), "functional performance" (Bottom et al 1999)
- "value" has been taken to mean "return on design investment" (Vandell and Lane 1989), "rental values" (Hough and Kratz 1983, Doiron et al 1992), "expected net present value (NPV)" (Baum 1993).

Collectively. However, they cover a broad range of design attributes.

Methodologies of ascribing value through observing inputs (independent variables) and outputs (dependent variable)

Despite the different questions asked and the widely varying terminology, there is a convergence of methodology. Thus the studies have approached the subject by attempting to isolate value attributed to design characteristics from that attributed to non-design characteristics.

The studies all employ a regression analysis, with or without a hedonic price analysis of the good. Hough and Kratz, Vandell and Lane, Doiron et al and Desyllas employ this method to ascribe value to design characteristics. Bottom et al's study focuses on the testing of two models, one of which is the regression model, and does not attempt to infer rental values.

The model of building quality suggested by Baum (1993) in the classification of depreciation and obsolescence (Figure 6) suggests that a residual method may be employed, but a straightforward residual calculation is not useful in isolating the value of one attribute among other attributes whose values are also unknown. This method would therefore be inappropriate in cases where "quality" was not already a mathematically defined function of exchange value.

The most commonly used approach in evaluating value of building characteristics is the hedonic pricing method which is able to isolate the contribution of a number of explanatory variables to variations in the price of a good, even when the contributions of other components are not known. A hedonic function is constructed to mathematically describe the value components and their relationship with the whole value of the good (the dependent variable). A large number of transactions involving the goods are observed, and the behaviour of each of the variables recorded. Regression analyses are carried out to infer the relationships between the independent and dependent variables.

How is building quality assessed?

Within this general model, Hough and Kratz and Vandell and Lane rely on the judgement of design experts to identify "quality", which both studies define narrowly as aesthetic amenity. The result of defining building quality in such a limited manner reflects only the opinions of a very small group (i.e. architects) rather than those to whom value (whether private or public) accrues (i.e. the users or investors). Vandell and Lane themselves acknowledge that the use of an expert panel necessarily relies on the "objectivity of the respondents and consistency with the opinion of market participants". This is arguably misplaced as "one of the most common findings in social design research is that designers and clients / occupants evaluate buildings differently" (Gifford 1997, in Zimmerman and Martin 2001).

Doiron et al simply look for the presence or absence of a single design feature, but do not claim that this represents "good" design overall. Baum (1993) by restricting the study to a narrow view of quality (i.e. quality is the resistance to deterioration and obsolescence) sets out the basis of a measurable assessment of quality, although the study does not go as far as applying the modelled relationship to a real sample of property. For Baum, the term "design" means "layout of physical

configuration”, with choice of materials to resist deterioration, for example, excluded from the definition.

Bottom et al (1999) examines most thoroughly what the “functional performance characteristics” of office buildings are and which might be closest to any set of characteristics that the present study might examine. This includes aesthetic concerns, but also concerns on a variety of other issues, such as quality of building enclosure, building services and work environment, thus presenting a more holistic picture of what building quality is. This in turn reflects the quality of design decisions that were made. The list of characteristics was developed with the help of office design experts from DEGW. Importantly, occupiers of buildings were interviewed in depth to gauge the worth they placed on each functional characteristic and its performance.

Desyllas (1999) employs the axial map technique (discussed above) that facilitates the translation of a physical configuration of streets into a numerical form that can be fed into a multiple regression analysis, by “reduction”. This technique fundamentally measures how important a street is within the city’s street network. This provides an independent model of the spatial structure against which the patterns of land use and value can be compared.

Results and discussion: does quality (or location, in some cases) add value?

Given the detailed examination of these six studies above, and their differing definitions and assumptions, any conclusions they draw with regard to “design quality” and “value”, while valid within the confines of their particular contexts, may not be universally applicable. This is because a holistic definition of design will inevitably be broader than or different from that postulated in these six studies (see discussion in Part One).

Vandell and Lane (1989) constructed an economic model that predicts equilibrium rent and vacancy behaviour as a function of both design and non-design characteristics. The model was tested using a sample of over 100 office buildings and was intended to detect correlations between “good design” (communicated through “design ratings” and defined as “aesthetic amenity”) and economic performance (rental values and vacancy rates). The study concluded:

- Design had a strong influence on rents, but a weak relationship between vacancy behaviour and design quality.
- Good design was shown to cost more to produce on average, but not necessarily.
- The magnitude of the point estimates of the rent, vacancy and construction cost effects suggested that good design may not be more profitable on average, but may provide a small probability of a higher return to the developer without any equivalent negative risk of a very low return.

Hough and Kratz (1983) developed a hedonic price equation for office space in downtown Chicago which was tested in a sample of 139 office buildings. This was designed to determine if the value of “good” architecture (a public good and defined as an “aesthetic” quality) had been valued by tenants or owners of commercial buildings. Hough and Kratz argue that the characteristics of buildings have an effect on their market value, unless there is a market failure, where the users are indifferent or

oblivious to the architecture, or are unable to register their preference through a market mechanism. Other authors have disagreed, however, and suggest that in many cases in office real estate, the market fails to demonstrate a link between design and investment returns (notably, Haynes et al 2000).

Several regression models were run by Hough and Kratz, with “average annual rent per square foot” as the dependent variable. Resulting regression estimates for each implicit price (of each attribute) and possible explanations were discussed, among which were measures of architectural quality (aesthetics). These measures of architectural quality exhibit some curious aspects. Neither national landmark status, Chicago (local) landmark status (i.e. listed buildings, the newest built in 1930), nor the combination of the two yields a statistically significant coefficient. For newer buildings (built between 1955 and 1978) that have won awards, the opposite is true, where an award appears to add \$1.85 per square foot to the annual rent. By contrast, older listed buildings have lower rents, possibly due to anticipated extra costs of upkeep. The researchers drew two key conclusions:

- Quasi-rents may be earned by the building owners and the architects i.e. they may be able to secure an income greater than would be expected from a less distinguished building.
- But buildings of architectural merit may cost more to build, and this may exhaust the premium paid.

Baum’s (1993) paper was not concerned with ascribing exchange value to particular building characteristics, and did not test his hypothesis against a sample of actual buildings. Instead his aim was to define “quality” in some of those building characteristics, and to set out a rational consideration of the questions posed:

- What is quality?, Baum (1999 p37) sets out “A full taxonomy” of building depreciation where quality is resistance to depreciation caused by physical deterioration or obsolescence.
- How does construction cost relate to quality? “Expenditure can be expected to increase the quality of a building in terms of external appearance, durability and internal specification. [although] Expenditure is not guaranteed to lead to good design....” (Baum 1993, p36). Thus he concludes that expenditure may or may not increase perceived quality.
- How can quality and total return be related? The overall conclusion is that high quality leads to better returns, and that design factors – especially plan layout, are more important than durability and other factors related directly to cost. But “configuration is less important to investors, who place more emphasis on external appearance, as evidenced by the effect of building qualities upon yields” (Baum 1993, p38).

Baum therefore draws a tentative conclusion that “the two most significant predictors of rental depreciation for offices are shortfalls in floor layout and in the quality and quantity of services provided” (Baum 1993, p39). “For income return and capital return through rental growth, configuration is the single most important factor. For capital return through yield, external appearance also becomes important” (Baum 1993, p44).

Finally, Desyllas (1999) concluded that there is a clear relationship between location rents and the purely spatial characteristics of the street grid and that “changes in the spatial structure of the street grid (in Berlin) that occurred with reunification are the precursor to the shift in rental value that has occurred since the fall of the wall” (Desyllas 1999 p242). However, he notes that the pattern of rents does appear to be one that depends not on the current local conditions of a location but rather on the potential offered by the location relative to the whole system” (Desyllas 1999 p242).

Type D: Dissecting the valuation process

Type D studies are those that seek to understand how particular judgements are made by valuers. This is contrasted with normative valuation models that identify what judgements should be made within the valuation process. The major body of research that fits into this category utilises what is broadly known as “a behavioural approach”.

Particularly important are two papers that address this issue of how valuation judgements are made. The first (Eccles 1996) is a critique of valuation methodology and how it addresses (or not) the diverse meanings of “value” because the very notion of “value” is culture specific. The second (Guy 1998) dissects the complex multi-way interactions of actors in the process of designing real estate, how the results of these interactions are brought together in the design specification, and examines the effects of these interactions on the built result. In doing so, he provides an overview of the different forms of “value” and “values” that exist even within the property business which is normally decried as only interested in profitability and financial success.

Eccles (1996, p39) argues: “Valuation techniques fail to recognise the importance of ... non-market values which are the result of personal utility and pleasure rather than price, cost, economic utility or profitability”. This is perhaps inevitable because market value is precisely the sort of value that valuers’ clients (property investors) are interested in, reflecting as it does “economic utility” and “profitability”. In conclusion, Eccles simply suggests that “professionals using narrow and traditional concepts of value should learn from the environmentalist debates, and move towards appropriateness and cultural integrity” (Eccles 1996 p49). Yet, he readily admits that there is no such thing as “cultural integrity” (which implies generality) when it comes to value, because value by very definition is “culture specific.”

The key lesson from the paper however, is that the problem lies not in valuation methodology itself, but rather in the “values” underpinning it. This would suggest that it is the “values” of valuation clients that may need to change if valuation techniques are to reflect a broader set of values. Certainly, if values did change then it is likely that valuation would follow suit in order to carry on providing the services that are necessary to clients’ demands.

Guy (1998) argues that “the methodological standpoint of past research has tended to ascribe the failure of the property business to adopt environmentally sustainable principles to either ignorance or apathy of individual development professionals, or the blindness of market processes to environment priorities). This has produced a ‘way of seeing’ the design and development process

which has blinded analysis...” (Guy 1998, summary report). Recognising that the property, like any other complex business is basically a bunch of interactions between people who each have different values that originate from their personal value systems, their professional standpoints and their place in the specific property project, he takes an “alternative analytical approach” to dissecting how these various actors in the development process interact relationally with each other and why they do so given their particular interests in the property business.

Figure 13 sets out the various actors and roles studied (from Guy 1998, p7)

Logic / Actor	Culture of Practice	Source of Knowledge	Units of Assessment	Value Extracted	Development Goal	Way of Seeing
Architect	Creative collaborators	Previous practice	Design solutions	Fees + reputation	Shape Buildings / Cities	Image / Machine
Developer	Team-based entrepreneurs	Local knowledge + gut instinct	Residual valuation	Enhanced value of land	Renew urban environment	Multipliable Asset
Occupier	Team-based specialists	Business operation	%Space utilisation	Min. overheads Max. efficiency	Appropriate space	Work space / symbol
Investor	Hierarchical experts	Investment performance	Comparable % returns	Income stream / capital gain	Grow capital/ hedge risk	Quantifiable asset
Agents	Individual entrepreneurs	Latest deals	Letting rates / market demands	Fees + market control	Construct market	Market comparable

From the detailed study of actors and behaviour, Guy (1998) proposed his five different “logics” that act as drivers to decision-making in property (see discussion above).

Behavioural approaches to understanding the valuation process

Such behavioural studies in the property field have been carried out by, among others, Diaz 1990, 1993, 1999; De Bruin and Flint-Hartle 2003; Hardin 1999 and Levy and Schuck 1999. Behavioural approaches recognise that, despite the implied assumptions to the contrary in traditional valuation methodology, that valuation is neither an entirely objective or rational process. Therefore behavioural approaches abandon the economic constructs of rational man for theories developed in psychology, particularly in human information processing and problem solving.

An overview of this relatively new field of study is provided by Diaz (1999).

He notes that the traditional approach uses regression-based econometric techniques to analyse transaction artefacts (prices). While regression-based techniques are good for descriptive research into resource allocation, and most successfully in pricing models, they are limited in application to property as cash flow-defined investments because the data consists of transaction artefacts and are limited in their ability to illuminate economic activity.

Economic activity as human behaviour

Diaz sets out an activities model of real property’s academic territory based on the concept of an economic activity as the process of generating the supply of or the demand for some economic good (Diaz 1993, in Diaz 1999). The convergence of the concepts of description (science) / prescription (engineering) and of economic activity / resource allocation results in a clear description of the property discipline. For example:

- lending activity
- investing activity
- professional activity
- governing activity
- consuming activity
- entrepreneurial activity.

All these centres or nodes of economic activity are interconnected by markets that allocate goods and services provided in one node to other nodes (see **Figure 14**).

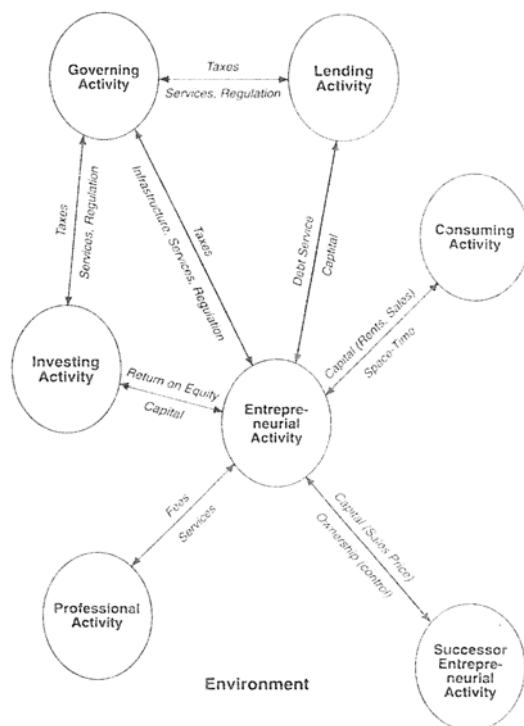
Thus the two key features of the model are economic activity and resource allocation (markets). Diaz argues that since economic activity is human behaviour, the observation of this behaviour within the property decision-making context throws new light onto the processes. Resulting techniques foreign to the traditional approach include:

- Controlled experiment
- Process tracing protocols
- Field surveys.
-

Evaluative statistics used include:

- Non-parametric or distribution-free statistics
- Analysis of variance

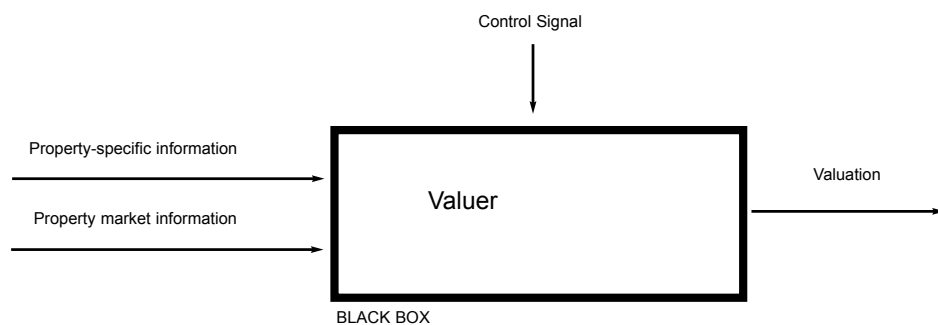
Figure 14 Diaz's (1993) Real Property Activities Model



The behaviourist model has been applied to studies over a wide range of real estate areas. Studies on valuation constitute the bulk of the literature (Diaz 1999; Hardin 1999), but have not (so far) been related directly to the relationship between design quality and property value. These models nevertheless appear to have a good explanation capacity in areas where neo-classical models do not (de Bruin and Flint-Hartle 2003). This is summed up in Levy and Schuck's (1999 p382) descriptive model, where these non-rational and subjective influences are depicted as a "control signal" that affect the parameters of the information transfer function, or even the form of the function itself (see **Figure 15**).

In the valuation process, to understand data or signals concerning various building aspects (e.g. design, engineering etc) often requires a different set of expertise from the valuer's core set. Hardin (1999) reviews this issue within a discussion of heuristics². With reference to Shanteau's 'Theory of Expert Competence', two of the five factors identified in this theory are of particular relevance to the real estate discipline.

Figure 15 *The descriptive model from Levy and Schuck 1999 p382*



The one most relevant to the present discussion is the need for "domain-specific expertise". Thus "In investigating human information processing ... special attention is required when specifying expertise because without expertise at some level, the existence and effect of heuristic use can only be inferred as a general decision making condition. Heuristic bias would occur because domain knowledge is insufficient and general information-processing heuristics are inadequate to address the task" (Hardin 1999, p335). "In summary, human information processing theory indicates that humans obtain domain-specific schema that lead to optimal decisions within the framework of their domain of expertise. Bias may occur because of the misapplication of schema that control processing heuristics or underdeveloped domain knowledge" (Hardin 1999, p335).

Thus if the argument made by Haynes et al (2000) for a three arena model of commercial real estate is taken on board (see Part One), then the knowledge domain of valuers might well need to include input from architects, facilities managers, and occupants, but also business analysts, operations specialists, performance managers, and IT experts. Diaz and Hansz (1997) look specifically at how

² Heuristic: a cognitive short-cut that allows for a reduction in the amount of information processed. It, in essence, is a cognitive data reduction process. Cognitive process simplification can be based on data, as well as declarative and procedural knowledge.

valuers use the value opinions of others, but no studies have yet taken a behaviourist approach to examine how valuers use the design opinions of others.

Levy and Schuck (1999) put this issue of knowledge domain in another way in their study of the influence of clients on valuations, which addresses a range of non-methodological factors affecting valuations and their outcomes. They identify three types of influence of clients on valuations:

- reward and coercive power
- expert power
- information power.

Of particular interest is expert power, which is “the extent to which others perceive an individual as being knowledgeable about relevant issues” (Kohli 1989, in Levy and Schuck 1999, p384). In the Levy and Schuck research, this is “clients’ knowledge of the valuation process and the property market within which a property is being valued” (Levy and Schuck 1999 p385), but this is equally applicable to the action of understanding and valuing design characteristics of commercial real estate.

Levy and Schuck go on to propose and test four sets of factors that might affect the degree of clients’ influence on valuations:

1. The characteristics of the individual or organisation providing the service
2. The characteristics of the client
3. External characteristics, including the regulatory framework, professional criteria and current market conditions
4. Characteristics of the service to be provided.

The qualitative research methodology used by Levy and Schuck may be relevant to future research aiming to understand how valuers do or do not include design factors in their valuations.

Type E: Studies that propose new valuation methodologies

This final section of Part Two reports on research into novel methods of valuation which offer, or could offer, better ways of detecting the influence of design and of depreciation on the market values of property and/or better ways of reflecting these influences in valuations.

As explained in Part One, many analysts think of better design as a means of slowing the depreciation of assets – improving the building's resistance to wear and tear and protecting it against functional or economic obsolescence. Accordingly this section begins by reviewing recent treatments of depreciation in the research literature, taking conventional valuation methods as the starting point.

The question of depreciation

Normally in valuation, income is “reduced to a “net” figure, i.e. free of all outgoings such as repairs and insurance (but not tax) so that it is comparable to other non-property investments. It is normal UK practice (except in some older leases) to ensure that the tenant is responsible for these outgoings (i.e. full repairing and insuring terms – FRI) so that rental values are normally quoted on a net basis” (Darlow, 1983, p 263). For example, if there were a new leasehold contract on FRI terms and a survey of the property showed that as a result of depreciation (or wear-and-tear) the property was in need of £30,000 worth of repairs or refurbishment, this would be reflected in the rent estimated. Thus, a rent below the full rental value (FRV) or market value on a relatively new leasehold on FRI terms might indicate a property showing signs of depreciation.

Darlow (1983, p263) also points out that “the yield will reflect...[among other factors]...the age, condition and hence life of the building; the lease terms (repairing obligations, frequency and timing of rent payments and rent reviews, service charges, etc); ... and finally the size of the investment and its liquidity. Very large investments, for example, will have higher yields, as fewer investors can afford the risk of having so many eggs in one basket, or the inflexibility if a lesser sum of money had to be accepted by a quick sale”. Thus, older or poorer quality or larger properties should show higher yields. Properties in good condition, with a long life ahead of them, will, in contrast, show lower yields.

“Salway (1986) and Baum (1991) have described the element of uncertainty that exists in the UK property market about whether prices paid for investments fully reflect the potential problems of building depreciation” (Bottom, McGreal and Heaney, 1999, p354). The academic community first recognised depreciation and obsolescence as an area not addressed by contemporary valuation techniques in 1982 (Bowie, cited in Baum, 1991: 32).³ This sent shock-waves through the property market, as well as the academic valuation community and, despite good rental performance, yields dropped by about a percentage point in all the sectors Bowie mentioned for the seven years following his publication (Baum, 1991: 44).

The CALUS Report composed under Salway’s editorship in 1986 summarised the worries of the real estate community relating to depreciation. Brown (cited in Baum, 1991, p35-6) studied the impact of financial considerations upon the design of buildings and concluded that “at most realistic discount rates it is not worth reducing construction costs if the building is to last more than a few years.” The 1986-7 period demonstrated a concentration on the effects of the deregulation of the City of London and the “need for more flexible offices, emphasis[ing] the need for higher quality buildings” (Pepper and Morgan, 1986 cited in Baum, 1991, p36).

These claims were supported by Richard Ellis’ (1985, cited in Baum, 1991, p36) which reported that property investors were paying increasing attention to specification, “accelerating the movements of occupiers within the City market, thereby impacting upon the investment returns to obsolete units” Povall (1986, cited in Baum, 1991, p36). Inflexibility had therefore been identified as the “major

³ Given Bowie’s assumptions, when depreciation is taken into account real yields are in reality approximately 20% lower than nominal yields (Bowie, 1982, cited in Baum, 1991: 44).

cause of commercial building depreciation” and was echoed by John Worthington (cited in Baum, 1991, p36) who “referred to service provision, floor-to-ceiling height, plan layout and building image as the four main concerns of City office tenants, all leading to the need for a flexible stock”. In relation to office buildings, IT was also “recognized as an accelerator behind organizational demands and expectations (Davis *et al.*, 1985).

The CALUS report described the incorporation of depreciation objectively and explicitly into discounted cash flow (DCF) valuations.⁴ Thus although market valuations are different from investment valuations in their perspective, if the market itself does not recognise the importance of depreciation then in all probability depreciation will not be accounted for in market valuations (Baum, 1991: 43).

Comparative valuation methods are most widely used for market valuations. Baum points out, however, that in investment valuations, which usually use DCF techniques, it is crucial that depreciation is fully taken account of. The replacement cost valuation method (see below), does take account of depreciation according to the guidelines of the Asset Valuation Standards Committee of the RICS (RICS, 1988) that refer to economic and functional obsolescence and to environmental factors. Clarke (1986, cited in Baum, 1991, p44) nevertheless points to the likely information asymmetries as a result of which occupants are much more likely to be aware of depreciation and obsolescence than are valuers. The CALUS attempted to predict these life cycle characteristics of physical building elements and components (Bottom, McGreal and Heaney, 1999, p343).

Valuation methods

One of the most up-to-date summaries of the most commonly used valuation methods is that by Pagourtzi *et al* (2003). They group valuation methods into two groups: the *traditional* and the *advanced*. Within the traditional group are included the investment method (income capitalisation method), the profits method, development method (the residual method), the contractor’s cost or replacement cost method, the multiple regression method and the stepwise regression method. Within the advanced group of valuation methods are artificial neural networks (ANNs), hedonic price models, spatial analysis methods, fuzzy logic and autoregressive integrated moving averages (ARIMAs). These different approaches are briefly reviewed below.

Investment method/Income capitalisation method

This is the simplest version of the comparative model and is used to determine capital value and rents directly. The rent also represents the return or interest on the money invested in the property by the owner. This rental income is simply a cash flow and as such the value of the rented property may be determined by the present value of the predicted cash flow.

In the comparative method, properties must be similar for the rent of one to be used as an indicator for the rent of another. Pagourtzi *et al*, (2003, p389) pick up on this, pointing out that “it is

⁴ “Many valuers consider that a DCF [Discounted Cash Flow] appraisal is a relatively new technique which academics are trying to use so as to turn valuation into a science when it can never be anything other than an art! While it is undoubtedly correct that valuation will never be an exact science, that is very different from saying that techniques cannot be improved or changed as circumstances change;...” (Darlow, 1983: 289).

possible to determine a gross rent multiplier by analysing other previous sales. Investors can be determined to be paying “x” times the rent for a particular type of property. The higher the multiplier the higher the market value, and this in turn reflects the greater attractiveness of the subject property”. Hence, this multiplier could be used as an indirect indicator of the perceived quality, depreciation and obsolescence of a particular property. Variations in the influence of depreciation (and of design) are thus handled implicitly either in the choice of comparables for rental estimation or in the choice of multiplier (yield) used in capitalising the rent flow.

Profits method

In this approach, the property is seen simply as a unit of capital producing a stream of income from which costs must be deducted before profit rent can be identified. Direct and indirect costs as well as depreciation and obsolescence should be accounted for (more or less explicitly) in these calculations.

Development/Residual method

The approach views properties as sites or plots with a maximum economic potential, which is equal to or greater than the use of the site currently and accordingly should or should not be redeveloped to release the latent value of the site. Thus the residual method of valuation is similar to the profit method. Valuation is undertaken utilising comparable vacant land sales, the details of which should reflect: location, grantor, grantee, recording data, date, sale price, financing, units of comparison, lot dimensions, configuration and size, physical and topographical characteristics, zoning, utilities and environmental influences.

In the residual method “the valuer assesses the market value of the land in its redeveloped form (either by comparison or by the investment method) and deducts from this, the gross development value, all the costs that will be incurred in putting the property into the form that will command that price...By deducting these liabilities from the final market value, a residue is produced. This residue represents the maximum capital expenditure for buying the land” (Pagourtzi *et al*, 2003, p390).

Contractor's/Replacement cost method

This is used in the limited number of cases of properties so specialised that they rarely come onto the market. In such cases it is effectively impossible to assess value by comparison, if no rental is produced by the property (i.e. an owner occupier) then the investment method is inappropriate, whilst it may be inappropriate to value the property according to the profits method because the property is not intrinsically linked to the business carried out within it.

A typical example of a property showing these characteristics may be a research establishment, where the equipment not the property is the more important contributing factor to the value of what goes on at the address. In such valuations, the valuer assumes the role of the owner of the building, asking “What is the market value of the building by reference to its replacement cost? Hence they would value the land by comparison and add the cost of replacing the building with a structure capable of carrying out the same function and then make adjustments to allow for the obsolescence and depreciation of the existing building relative to the new hypothetical unit” (Pagourtzi *et al*, 2003, p391).

According to the Lands Tribunal, one percent p.a. depreciation of the value of the land should be deducted from the sum of the value of the land and the cost of construction (adjusted for today's costs of constructing an equivalent building). This appears arbitrary and (in much of modern Britain) unrealistic. However, office buildings are not normally of the type for which the replacement cost method would be appropriate, unless highly specialised such as GCHQ.

Multiple regression method

This method has the advantage of allowing the explicit incorporation into the valuation of a much greater number of explanatory variables which might impact on value and produces a coefficient for each variable pointing to its relative importance in accounting for observed differences in value. In a multiple regression valuation model a factor X_i could be included for age and be subject to a parameter β_i which could reflect an assessment of how depreciation and obsolescence impact on value per annum. It is therefore possible to experiment with separate factors for physical depreciation and functional obsolescence, perhaps acknowledging that depreciation might take place at a constant rate, whilst obsolescence might represent a given specification list which would describe the property's "modernity" (when it was constructed) and accordingly how obsolete it is compared with a specification list describing a new building. Multiple regression techniques can handle all manner of attributes, providing that these can be expressed in quantifiable, or at least ordinal, terms.

Stepwise regression method

This method is a variant of the broader family of regression methods and distinguishes the relevance of explanatory variables from candidate explanatory variables when the number of candidates is too large to allow all possible regression models to be computed. If, for example, depreciation and obsolescence are considered as candidate factors acting upon the value of the property per sq meter and are found to be insignificant (according to the probability P_1 level which the researcher determines), then they would not be included in regressions to find their importance to the specific property valuation or group of valuations. The computation procedure starts by including explanatory variables that offer the strongest explanation of variance, adding others 'stepwise' until the additional level of explanation gained becomes trivial.

Hedonic price models

Hedonic price models come from the discipline of economics and represent a theorised approach to the construction and interpretation of multiple regression analyses. "A differentiated product can be represented as a vector of characteristics with the market price dependent upon the set of features. The market price of the product implicitly reveals the hedonic price function relating characteristics to prices. The traditional use of hedonic estimation in housing studies has been for the purpose of making inferences about non-observable values of different attributes like air quality, airport noise, commuter access (railway, subway or highway) and neighbourhood amenities" (Janssen *et al* 2001, p395-6). Measures of depreciation or obsolescence could be included in the vector, as could design and other attributes.

"The hedonic approach has some 80 years of evolutionary development behind it since agricultural economists first implemented it as a purely empirical technique to help identify the characteristics of

vegetables commanding the highest price. Since Rosen's (1974) contribution it has become one of the standard techniques for analysing the price of complex goods, particularly that of housing". (Cheshire and Sheppard 2003, p3).

While applications of hedonic models to explaining (and thus estimating) property values have hitherto been restricted mainly to housing markets, they do constitute powerful tools which could cast light on the behaviour of the office markets if sufficiently large samples can be found (e.g. from the Investment Property Database). One particular feature which makes them attractive is their capacity to distinguish local urban design factors (immediate environmental quality, proximity to shops and cafes, street configuration, views and so on) as influences on value – factors which otherwise are almost impossible to separate from the other attributes of location (transport accessibility etc).

A second attractive feature is that, in a hedonic model, relationships can be specified in non-linear forms to see whether, for example, some variables change their impact from one end of their range to the other. Beyond a certain point, for example, generous car parking may add little to the rent paid for a building, while the provision of modest levels of parking may be almost essential. Probably the strongest attraction of the hedonic approach, however, is its experimental nature. Thus it is conducive to the testing of hypotheses and hunches about what may influence values, and about how the various hypothetical explanations can best be specified.

One difficulty in applying hedonic price modelling, however, is that to separate internal design features from external (urban) design attributes may be distortionary. This is because the whole purpose of the approach is to discover the contribution made by all explanatory variables (separately and in combination) to variations in market rents. Thus to omit the internal features would be to guarantee that the effects of external design features (and perhaps building age) was distorted.

Artificial neural networks (ANNs)

A possible solution to many problems encountered in property valuation has been proposed in the form of ANNs. These are artificial intelligence models designed to replicate the human brain's learning process. They must first be trained from a data set, after which they can then be used to estimate prices of properties from the same market. The model consists of three layers:

- Input data layer
- Hidden layer(s) or "black box"
- Output layer or estimated property values.

The hidden layer contains weighted summation functions and transformation functions. Together these functions translate inputs to outputs. This method could be used, for example to test the relationship between office property age and value. In such a case, it may be found that age itself is not significant but that specification that reflects age (e.g. floor-to-ceiling-heights for IT networking) is a significant factor. In general the method has a similar aim to the regression approaches – to produce valid generalisations about behaviour (in this case about price

determination) which have predictive power – but it is rather less explicit about the role of each explanatory variable and thus perhaps less useful from a research point of view.

Spatial analysis methods

The use of Geographic Information Systems (GIS) can help analyse problems with a spatial component (e.g. how does neighbourhood/location affect value) through spatial pattern analysis, autocorrelation analysis, variography and Kriging techniques. A more advanced way of accounting for the spatial component can result from a move away from assigning fixed neighbourhoods using a more rigorous spatial interpolation to the development of terrain or surface models. This, however, is an aid to the manipulation and handling of data, rather than a theory or method of analysis. It could nevertheless be helpful as part of a regression or hedonic analysis (Pagourtzi et al, 2003).

Fuzzy logic

Classic Boolean logic is binary, that is a certain element is true or false, an object belongs to a set or it does not. Fuzzy logic, introduced by Zadeh in 1965, permits the notion of nuance. The key to Zadeh's idea is to represent the similarity a point shares with each group with a function (termed the membership function) whose values (called memberships m) are between $0 < m < 1$. Each point will have a membership in every group, memberships close to unity signify a high degree of similarity between the point and a group, while membership close to zero implies little similarity between the point and that group. Additionally, the sum of the memberships for each point must be unity. Every continuous maths function can be approximated by a fuzzy set. Several types of membership functions can be utilized. The membership function reflects the knowledge for the specific object or event (Pagourtzi, 2003).

Another critical step in the fuzzy systems methodological approach is the definition of the rules, which connect the input with the output. These rules are based on the form "if...then...and".⁵ The knowledge in a problem-solving area can be represented by a number of rules. Fuzzy logic could potentially be useful for the incorporation of depreciation and obsolescence into valuation methods as these are "uncertain" factors (Pagourtzi, 2003).

Autoregressive integrated moving average (ARIMA)

Autoregressive (AR) models can be effectively coupled with moving average (MA) models to form a general and useful class of time series models called autoregressive moving average (ARMA) models. However, they can only be used when the data is stationary. This class of models can be extended to non-stationary series by allowing differencing of the data series. These are called autoregressive integrated moving average (ARIMA) models which were popularised by Box and Jenkins (1970).

There are a huge variety of ARIMA models, for example the general non-seasonal model is known as ARIMA (p, d, q):

- AR: p = order of the autoregressive part.
- d = degree of first differencing involved.

⁵ "if obsolete...then...and"

- MA: q = order of the moving average part (Makridakis *et al.*, 1998).

There is some research that applies the Box-Jenkins methodology – ARIMA model to the study of Hong Kong's real estate prices (Tse, 1997). This example shows how the office and industrial property prices in Hong Kong can be fitted into the ARIMA equation, however the model has not been extended to consider design impacts.

PART THREE: Intermediate conclusions

Part Three describes some intermediate conclusions drawn out of the literature review, and five recommendations that flow from them.

Findings

1. Summary of the literature

The literature linking design quality to property exchange value is fairly sparse. Although there are established literatures for the issues of valuation methodologies (Type E), the linking of building attributes to a price using the hedonic pricing method (Type C), valuation behaviour (Type D), design quality and its assessment, building quality and its assessment and urban design quality and its assessment (Types A and B), there are very few studies that link a holistic notion of design quality directly to property values.

Nevertheless, valuable lessons can be drawn out of the existing studies in order to map a research path forward.

Definitions of the independent variable(s)

As shown in **Figure 12**, definitions of design or building quality in the field are too limited in scope. Most do not reflect the breadth of “design” or “building quality” or “urban design” that a holistic view of the subject would require. Thus few of the Type C studies exhibit the breadth of independent variables suggested by Types A and B studies, and those that do cover the breadth (notably Bottom et. al. 1999) do not explicitly set out to link design issues with property value.

Definitions of the dependent variable

The dependent variable is some indicator of the property’s value. Whether this “value” should be defined as the rental or sales price (i.e. exchange value only) or as a more accurate understanding of value as “worth” will depend on the circumstances. The issues of choosing the precise definition of the dependent variable is discussed in the various Type C studies reviewed (for example, Vandell and Lane 1989, Hough and Kratz 1983, Doiron, Shillings and Sirman 1992, Desyllas 1999).

Vandell and Lane (19989) point out, for example, that rents may not tell the whole story about exchange value in the user markets and need to be adjusted to take account of vacancy rates while Desyllas (1999) adjusts headline rents to allow for rent-free periods and other inducements. These examples (and others) may reflect broader (or at least different) conceptualisations of “value” (i.e. worth) than merely “property price”. The question to be asked is who is “value added” to. If it is to the developer and investor, this will usually be added in the form of profitability rather than actual property prices. Thus the cost of producing and maintaining value needs to be taken into account.

On the latter issue, Baum (1993, p32) has defined depreciation as “a loss in the real existing use value of property”, arguing that property developers will always attempt to maximise expected net present value (NPV). Because this depends on the relationship between income, future capital value

(derived from income growth and future yield) and cost, the issue is whether increased investment in better design (if increased investment is required) will lead to higher income and / or capital value sufficiently to raise NPV to cover and preferably exceed the costs.

Methods and techniques of data collection and translation for design or building quality (the independent variables)

The following questions will need to be weighed up in designing more robust research and valuation methodologies to test the linkage between design and value:

- Will it be a more or less prescribed method of collecting and translating data (e.g. axial mapping vs. architectural competition comparative techniques)?
- Will it rely entirely on a professional evaluation of quality (e.g. Hough and Kratz 1993), or will users be interviewed directly (e.g. Bottom et al 1999)
- Will multiple (and alternative) scoring systems be tested as permitted, for example, by hedonic analysis?

Methods of estimating values

Quantitative approaches used so far to correlate design and economic value variables have almost invariably used multiple regression analysis (MRA) methods as part of hedonic price analysis, although other methods of inferring value have been proposed, notably Analytical Neural Networks (Bottom et al 1999), which have some appealing features. Where a regression technique is used, data collection techniques for the dependent variables must be addressed with care:

The choice is often linked to the availability of information, among other issues, and to the feasibility of adjusting headline rents and yields for rent-free periods and other effective discounts (see for example the Berlin work of Desyllas, 1999).

2. Values, not value are the root cause of problems

Eccles (1996, p43) pointed out that property valuers subscribe to a narrow definition of the term “value” in their work, but at the same time recognises that “any attempt at universal definition is flawed”. This is because “Value” is inextricably determined by the “values” of its recipients. Therefore “It is important to distinguish between values and value. Our values are the principles by which we live. They are core beliefs, morals and ideals of individuals (or organisations) and are reflected in their attitudes and behaviours” (Thomson et al, 2003). “Value” on the other hand means the worth of an object, action or phenomenon to the person experiencing it. Thus, if the “value” of property is defined by valuers as “market value”, this is because that is what is important to their customers (investors and developers) and their transaction partners in the market (i.e. buyers or users of property), in accordance with their “values”.

The “values” of investors, developers and other market players may or may not have “design quality” issues in a place of high importance, and whether design quality is taken into account in a valuation will reflect this. Thus it would be far more useful to recognise the possibility that the fundamental cause of design being excluded from valuations (if it is) is a market that does not recognise “design quality” rather than blinkered valuers or valuation methods.

This of course does not mean that valuers and valuation methods have no influence over the market, or at the very least, over how the market is represented and perceived. Valuers, because they are perceived as professionals, stand in danger of becoming the biased filters of value information, although conceivably this could be less true in a commercial property investment scenario, where a range of appraisal and valuation methods may be used and market players could have significant “expert power” (Levy and Schuck 1999). If valuers do distort values, then a “chicken-and-egg” situation arises, since valuers may draw on what they think the market or economy is doing, which in turn is based on other recent valuations. The phenomenon of “smoothing” (see, for example, Quan and Quigley 1991) has similar causes.

3. Multiple actors with different priorities operate within an unresponsive market

There are approximately two-dozen categories of specialists that influence the delivery of any building, with each category or professional group having its own outlook, technical language, goals and incentives for reaching their goals. Each actor has a different incentive to optimise the aspect of the building or the construction process that they influence, resulting in a difference between who pays and who benefits from various investments of effort and money at different stages of the building delivery process (Zimmerman and Martin 2001, Guy 1998).

So, for example, “Those who occupy and use the building or who ultimately pay the bills have little or no influence over the first cost decisions that affect the costs they bear. With any of these groups, the direct link between their objectives and the initial objectives, or long term needs of the organisation for whom the space is provided, is tenuous at best (Zimmerman and Martin 2001 p171). The problem is also that poor building conditions for tenants seldom result in their vacating the building. This tends to reward developers and property owners by maintaining reasonable occupancy. In other words inertia and transaction costs make the market very insensitive.

Weisbrod (1964 in Hough and Kratz 1983) describe situations of market failure due to non-revelation of option demand. These are characterised by:

- Infrequency of purchase of the product
- Uncertainty of purchase of the product
- An indivisible product.

The office rental property market exhibits these characteristics. In addition, most interaction of occupants with the “real estate” they inhabit is mediated by facilities management services. Thus it is often not clear whether occupation problems are caused by poor facilities management or by building fabric, design or tenure factors.

4. Studying normative valuation methodologies is not useful

One component of this review has been to look at innovative “valuation” methodologies; that is, ways in which monetary values have been ascribed to pieces of real estate. This was the subject of the ‘Type E’ studies above, and of Element 4 in the conceptual framework (**Figure 1**). Its inclusion

has been driven by a suspicion that normative valuation methodologies are “blind” (or nearly so) to design quality, and therefore do not “capture” the value attributable to design sufficiently.

However, the review has shown that:

- Valuation methodologies do not necessarily exclude design, they just do not include design in an explicit way. Therefore whether design is or is not taken into account when arriving at a number is not always clear.
- Where design is taken account, its evaluation often takes place in a “black box”, which, after Levy and Schuck 1999, is in the valuer’s head, and would be subject to professional (and unavoidably, personal) bias. This despite the fact that there are many studies that try to make explicit the evaluation of different aspects of “design” in the built environment (be it building or urban design) or “building quality”, as the range of Type B studies shows. Studies of bias in valuation have been the subject of much behavioural research into real estate (Diaz 1999, Diaz and Hansz 1997, Hardin 1999 among others), but no studies have yet been found in which the valuation of “design” aspects has been studied using behavioural approaches.

5. The value of MRA

The review showed that there are alternative available techniques for the analysis of variations in property values that have the potential to distinguish the contributions of all the various factors that may contribute to that variation. Most promising are the multiple regression analysis (MRA) techniques, and specifically the hedonic analyses which use regression as a tool. If samples of the necessary size can be found, these techniques could be invaluable to cast light on the extent to which design variables contribute to the obsolescence or decay of buildings.

While these techniques are not primarily valuation methods (i.e. methods to enable valuers to ascribe value estimates to real or proposed buildings), the findings generated could lead to more explicit methods of valuation or – in their mature form – offer estimation equations for office buildings that could supplant today's estimation procedures with something more accurate, transparent and explicit.

Recommendations

1. Understanding value and design

The breadth of meaning of each of the terms “design”, “quality” and “value” coupled with the inherent situation-specific nature of “value” means that a definitive, all-singing, all-dancing project to definitively link design and value or a valuation methodology covering explicitly all possible aspects of value will be an impossibility. It is clear, however, that most studies in this area have taken an often highly partial view of the field, and that a holistic view of design has to be taken in order to cover the full range of stakeholder concerns.

Of particular importance in this endeavour will be the need for clear and rigorous definitions of the terms and variables in order to ensure that all the relevant aspects of design and economic value are covered. Particular issues will include the concerns for initial cost/investment, occupier incentives and depreciation over time.

2. It is the market that needs convincing

Once it is recognised that it is values and not value that is the root cause of the problem, and that it is the market, not the valuation methods that is the root of design exclusion, we realise that the market is waiting to be convinced that “good design adds value”. Trying to gather evidence that “good design adds value” from the market, and then trying to sell it back to the market as a reason to invest more money in design may therefore represent another chicken-and-egg situation. Therefore it is important that at some point in that cycle, that the causes of the status of design in the market are addressed; in other words why is design often not a priority?

One means will be to address the root cause of the problem, which is the nature of demand. This means generating demand for “high quality” well-designed office space. In this vein, a particular task may be to influence consumers about what they ought to expect of their property, so that they can take appropriate action to exercise their preferences through the market mechanism. This would have to be accompanied by improvement of market mechanisms in order to reward suppliers for providing such property (see below). Thus consumers may need to be given technical help in understanding the impact of high quality designed space on their business performance.

Another means will be to incentivise the suppliers of property to supply more better quality properties. Apart from simply waiting for consumer demand to trickle through, this could be achieved through the legal or policy frameworks that set the context in which property is financed, planned, developed, constructed or in which property transactions occur. “Softer” less legalistic approaches could also be used. This incentivisation of property suppliers would be necessary if particular aspects of “quality” that do not immediately or obviously benefit consumers need to be achieved, and thus, the market does not become the mechanism by which value is generated.

One example may be the provision of good quality public space in the vicinity of a new development, which would generate considerable “public benefit”, but not much apparent “private value” that can be captured by developers or users. Another example would be the design of more energy efficient developments.

3. “Oiling” the market

With reference to the various actors and their interactions within the property market, the changing of property consumers’ minds to appreciate “good design” and to expect it is all very well, so long as this demand can be exerted through the market and its effects felt by property suppliers. However, as the review showed, the nature of property means that quite often this does not happen.

Oiling the steps taken before occupation

The real estate arena (as distinct from the facilities management side) always deals with very “difficult to change” issues, for example, location, building orientation, building layout. It would therefore make sense to let the user preferences be exerted before occupation, for example, through:

- Better information and decision support services for potential consumers / occupants
- Tenure flexibility that allows for the exertion of tenant preferences within the terms of the contract

- Use of instruments such as DQI to stimulate debate around the needs and values of different actors.

Oiling the steps taken after occupation

Linking facilities management with property supply is a feature of some contracts such as those associated with PFI. The success of such a strategy will depend on the relationship between the facilities provision element and the property supply element, although this interaction is likely to vary depending on the nature of the development, for example, whether owner occupied or speculative.

Post occupancy evaluations are one systematic way of reviewing the success of “fit” between occupier need, facilities management and real estate design during occupation. As discussed in Part Two, PROBE has introduced a particularly successful benchmarking exercise from which future designs can learn.

4. A behavioural approach is needed to studying valuation

Rather than focusing on the technicalities of valuation methodologies per se, a shift onto a more behavioural approach may be the best way to understand the inclusion or exclusion of “design” aspects in property valuation. By this means it may be possible to address the question of why particular characteristics are included (or given more weight) in a valuation, rather than simply what steps are taken.

This goes right to the heart of the problem, rather than simply addressing knock on effects. Research into how design decisions are made, and why they are made in a real estate context will help policy-makers address one of the root causes of poor design in the built environment. This understanding is required before the nature of demand for better design can in turn be understood and addressed.

5. Towards a more explicit recognition of design value

Despite the concern that office markets are unlikely to be quickly and easily convinced by evidence that design adds economic value, it is equally apparent that valuers of commercial real estate are unlikely to change their assumptions about value unless, first, hard evidence is provided that better design can add economic value, and 2. that they perceive a demand from their clients for that value.

Demonstrating these links will not be simple, nor (no doubt) will the evidence be straightforward. Thus research is likely to show that in some circumstances, contexts and markets better design will add value and in others it will not. Equally, some dimensions of a holistic design agenda will undoubtedly add value, whilst others will not. Finally, some design interventions will cost whilst others will not and of the latter some will generate value in excess of their cost, whilst others will not. All these factors and many more can only be tested through a large multiple regression analysis seeking to correlate dimensions of economic value with dimensions of holistic design.

The next part of this report sketches out a methodology for such a study that also encompasses a behavioural analysis of stakeholder actions and motivations.

PART FOUR: Moving the research on

This final part of the paper reports on a testing process of the findings and recommendations presented in Part Three, a process leading in turn to a refined methodology for moving the research forward. The first key testing process was a series of interviews undertaken with key stakeholders in the property production and consumption chain. The second was the feedback received from the audience of an Expert Seminar held at the RICS in London on the 30th April 2004 in front of an audience of investors, property advisors and surveyors.

The key findings from these two processes is presented below, before the refined methodology is in turn established.

Stakeholder interviews

Six interviews were conducted with a range of players in the office property sector to gain a broad set of views on the intermediate conclusions. Of the six interviews, two were with owner / developers of property, one with a professional portfolio valuer, one with a letting agent, one with an architect and one with a researcher with a broad overview of the property supply and consumption process.

Background and definitions of design and value

The definitions of design arising were varied both in the actual definition and in their scope, mirroring the findings of the literature review. Design quality in a property context is linked to the ability of the property to generate an income stream, which, it was argued, is likely to be reflected in its value. This ability was recognised as being defined by the recipient (for example, a tenant's view will be different from an owner's view will be different from a developer's view), and will be dependent on timing (market conditions) and on the location of any given property.

These non-design aspects, including location and covenant strength were considered the most important drivers of property value. These non-design aspects apart, design quality was broadly recognised to encompass aspects of aesthetic design, functional design and connectivity; however, the specific design aspect that many considered most important was the basic layout or configuration of the property. This includes issues such as structural grid, floor depths and floor to ceiling heights. Other key design drivers of value included urban design, building landmark quality, environmental performance and systems performance. In a leased property, it was argued that the non-design and design aspects together contribute to the lettability of the property and its effective rental value (which could take into account re-let rates, voids, and the necessary inducements required to attract tenants). These two issues are the basis on which both rental or capital valuations of a property will be based.

If value is indeed defined by the recipient, then an understanding of what different players consider valuable and how their considerations impact on the market value of a property is important. Most interviewees noted the differences between the interests of developers and those of occupiers, and how this affected their behaviour in specifying design, particularly the impact it had on design

quality and design innovation. It was noted that speculative developers are under particular pressure to behave in a conservative way, not only from their shareholders but also from insurances costs, banks and notably market behaviour as mediated through the conservatism of letting agencies.

Design, costs, property value and profitability

Interviewees considered that the opportunity to break the constraints of a conservative market most often arose where the developer and the occupier are the same party (owner occupation) and thus, the speculative aspect is excluded from design decision-making. In these cases, the problems of over specification can be avoided as design becomes a far more bespoke process, and innovation is more likely to be pursued. Issues of lifetime and maintenance costs will also become more important and design is more likely to be geared towards optimising these concerns. In the case of a speculative market, change to the conservative market is probably better articulated by the “demand” side of the property equation.

A further point is the very different requirements for building configuration imposed by different occupier activities, for example, the space requirements of a law firm is very different from those of a trading floor of a bank, such that a building that is ideal for one activity will be entirely unsuitable for the other.

On the issue of design quality and the costs of development, a range of opinions were apparent. Generally, “good design” may or may not cost more, although it was generally noted that cost was less important than the value added by any decision to spend more on a project. One way to keep costs down is to work more closely with an occupier, thus there is less mismatch between perceived quality delivered and actual quality required. Another source of higher cost to achieve good design is the professional time spent on satisfying additional layers of public design requirements, such as those imposed by the GLA, CABE and English Heritage. While the general value of these layers was recognised, the economic value added for specific projects that could be captured by the owner or occupier was believed to be questionable.

On the issue of design quality and profitability for the developer, it was noted that changes to occupier requirements over time could alter the value of any design decision, but that once a lease is signed, covenant strength and the terms of the lease become far more important drivers of value than design quality. It was also noted that the structure of leases (for example, whether FRI or not or length of periods between rent reviews) played an important role in how a building owner could increase profit margins.

This discussion relates to issues of facilities management. In this regard, strategic decisions are far more important in terms of affecting the impact of a building’s design on its value than operational decisions, and need to be made when the building is being designed. It was recognised by interviewees that it may be useful to involve facilities management consultants during the design stage, it was noted that this usually does not happen with a speculative development.

Valuation methodologies

As for the issue of whether design issues are given fair consideration by professional valuers, one opinion was that valuers simply reflect the demands of the market, and are therefore as sensitive (or as insensitive) as the market demands. However, this process is to some extent mediated by the views of letting agents, who, when appraising a building design for a speculative development seem to allow little room for design experimentation. Instead, a letting agent will always insist that a building that will hold its value and remain lettable should connote “niceness”, quality and comfort. The key requirement for them, and for a building to be let is that the potential tenant must be absolutely sure of the quality of the building, leading to highly conservative decision-making.

The developers interviewed did not consider their own attitude to be conservative, and indeed stated that their job was to always look for an “upside” when considering design decisions and value. This implied that they always look for design decisions that could generate more value. In contrast, the ultimate clients for “professional valuers” are typically banks or other investors, who, by the very nature of their involvement, will hold a more conservative view, or potential buyers or tenants, who are interested in what could go wrong. Thus much consideration of design characteristics by valuers happens in a negative light.

On the issue of valuation methodologies in use and their sensitivity to design issues, the opinion was that DCF methods were slightly more sensitive than traditional yield methods as they attempt to take into account the nature of future cash flows. No other experimental methods appeared to be widespread in practice. One important issue raised by interviewees was that of obsolescence: in old buildings nearing the end of their leases, valuation is particularly sensitive to pressures of circumstance: for example, there may be pressure from the owner to achieve a particular book value at the end of lease, and this value is tied closely to whether a lease renewal or a re-let is achieved. The accuracy with which issues of obsolescence are taken into account is therefore of concern.

What the interviews confirmed

The interviews largely confirmed issues raised through the literature review. First, that any investigation into the relationship between design and value is far more about “the mediation and intermediary of both the letting and capital markets”: this is a more profound than and goes beyond the issue of valuation. This broadly corroborates the conclusion of the literature review which suggested that it is “values” and not “value” that is important.

Second, that market value is time and place determined rather than design quality determined: “You may have the most wonderful piece of architecture, but if you have it in the wrong location or at the wrong time, it might as well have no value”. However, design was considered to play an important secondary role in defining economic value, particularly in the non-speculative market.

Third, that market value is based on the perception of recipients of that value. Thus because any valuation effectively attempts to predict income flow generated across the lifetime of the building, decisions (design and otherwise) are made in the context of “future-proofing” the building, by establishing what is most likely to generate the best possible income stream. Thus, a property’s value is maximised when the gap between the property consumer’s perception of a building’s use value and

the property supplier's offer (design, lease terms, rental rates etc) is minimised; in other words, where there is greatest match.

Finally, therefore, on the core issue of the relationship between design quality and property market value, the overall impression gained from the interviews and from the literature suggests that the economic value of design could be defined as a measure of the degree of match between occupier requirements (configuration, landmark and other aesthetic qualities, quality of surroundings, environmental performance etc.) and building design as perceived at any one point in time. Inevitably this will vary depending on the occupier and their priorities, and invariably by the market segment in which their interest is located.

The expert seminar

Discussion at the seminar was structured around the findings from the literature review, plus three expert papers commissioned to reflect on issues concerning valuation and design. Papers were commissioned from:

- Francis Duffy, DEGW
- Angus McIntosh, King Sturge
- Francis Salway, Land Securities

A fourth paper was commissioned but not presented at the expert seminar, from:

- Charles Ward, University of Reading

The discussion in this section reflects both the content of the papers, and the substance of the discussion. Again, a large degree of consensus was obvious around the five key issues raised by the literature review. This stage of the work confirmed:

First, that an essential part on any research trying to assess the relationship between good design and property values is a careful and rigorous definition of design attributes and of 'value' itself, and that is by no means an easy task.

Second, that property values reflect by and large market expectations, and therefore a full understanding of whether or not design qualities are fully reflected in property values is more likely to be achieved by understanding how much market players value design and how they do it, rather than by an exclusive focus on valuation methodologies.

Third, that different players in the market value design in different ways and their own appreciation of design quality is conveyed to other players through market signals that are not always as responsive and efficient as desired. It is the players' interpretation of these signals that ultimately determine the place of good design among all the determinants of property value. Therefore, research into the relationship between design quality and property values needs to look at how the expectations of different players are transmitted to others via market mechanisms.

Fourth, valuation decisions are exactly that: individual decisions taken by market players and informed by their views on what should and should not be taken into account. Some of this process will be based on more objective information and some on more subjective ideas and intuitive thinking, as well as past practice and experience. Understanding how those decisions are arrived should also be a key research objective.

Finally, participants at the seminar generally agreed that it would be important for hard evidence to be produced to demonstrate the relationship between design quality and the market value of buildings.

In addition the seminar raised a set of issues not directly addressed in the literature review, but which complement and explore in more depth the five key messages in Part Three. These issues also suggest ways of treating key variables in a possible regression analysis seeking to correlate dimensions of market value with dimensions of design quality and should be integrated into the conceptual framework underpinning any future research methodology (see below).

The first point is that the 25-year long FRI ('full repair and insurance') institutional lease that dominates the UK office market seems to create a massive distortion in rational decision making when it comes to assessing and valuing the long-term implications of design decisions. It also potentially distorts long-term management decisions. It leads property investors to focus on rent variations in the first or second rent reviews, usually after 5 or 10-years, and to a situation in which refurbishment costs beyond these time horizons have very little impact on the net present value of a new building. The suggestion here is that the research should investigate whether this is really the case and how this focus on the short-term affects the valuation of elements of design quality which are of longer maturation.

The second point is that the increasing importance of human capital and organisational performance as affected by building quality and reflected in the operational costs of office-based businesses might be changing the way occupiers value elements of design. Future research should be designed to detect whether this is happening and how this is being captured by the supply side of the market and the valuation professionals.

The third point is related to the first two in that there might be a skills problem in determining the value of good design as a part of the value of a building in the sense that the people that value buildings, i.e. investment portfolio specialists, might not have the skills to measure costs in use by occupiers and future refurbishment costs. The fact that the market currently does not require a deep understanding of either of these concerns because of the way it works militates against that expertise being developed and incorporated into the 'pricing' of buildings. Understanding how occupiers' views on building values are transmitted to building developers and owners and how valuers make their decisions might clarify these issues.

Another series of issues deals with the nature of the variables that should be considered in a multiple regression analysis of the kind proposed in Part Two (above). The first of these concerns what should be taken as a measure of value i.e. better designed buildings might not command higher

rent but they may minimise letting risks and reduce vacancy. Value in this case, for example, should incorporate not only rent levels but also how much more readily better designed buildings are taken up by occupiers and how much less time they remain vacant.

Second, there is plenty of evidence to suggest that land and buildings are two separate entities even if they are bundled together in the assessment of property values. Moreover, the evidence suggests that in areas where land values are high as a proportion of total property values (e.g. central London), design might be less important to investment performance as performance will depend far more on the performance of the land component of the property.

Third, the market moves in cycles and the relationship between design quality and value is likely to vary accordingly. Thus in upwards-moving markets, considerations of design quality might become less relevant given a general increase in property values. The real test here is how well a building performs in different market conditions, i.e. whether it re-lets or remains let in weak markets and how much design quality influences its performance.

Fourth, any regression analysis should try to isolate variables that have been proved to explain property values to a larger degree than most. Location, accessibility and planning restrictions which create scarcity of some types of property are each a case in point.

Another fundamental issue is how design-related variables that are critical only in the future are given a present value (e.g. depreciation, refurbishment costs) and what the implications are for how design quality is assessed. This is a function also of the market conditions at the time of the valuation (e.g. in a high interest rates situation, long-term variables are less important in determining present values, and vice-versa), and on how long-term costs are absorbed in accounting practices (e.g. it might be advantageous and tax-efficient to trade-off capital investment costs for maintenance costs and vice-versa). Further examination of the literature on depreciation and obsolescence may provide insights on how to tackle this problem

Finally, there is the issue of how the market values the adaptability of buildings, their capacity to be changed (sometimes radically), to accommodate new uses and new demands (e.g. from offices to hotel, to housing, back to offices, etc.). Planning regulations play a part here, as does the understanding of the need of occupiers present and future. The key point for the research is to clarify how this is reflected in current decisions about value.

A proposed methodology

The literature review, interviews and debate at the Expert Seminar all suggested that:

- Valuation is unlikely to be the key problem
- That the relationship between design and value will not be a simple relationship and that different markets and different aspects of design will add value in different circumstances
- That a key concern is stakeholder motivations and aspirations (their values) and that not nearly enough is understood about these concerns and how they distort (or not) the value associated with design

- That similar ingrained processes of property transaction, leasing and accounting also need to be understood and their impact on design
- That trends may be changing in how real estate is valued by occupiers, and that careful analysis is required to understand these trends
- That to change these ingrained values, clear evidence is required to change minds about how investment in design performs in different places over time and for different stakeholders
- That a broad view of design and value variables will be required to reach definitive conclusions, as well as a methodology capable of correlating these multiple variables
- That only once these relationships are understood should the tricky issue of valuation methodology be tackled and the extent (or otherwise) that it recognises design factors.

The way forward in understanding how design quality is reflected in the value of office buildings is therefore likely to be through extensive statistical studies of samples of buildings. This can be achieved by undertaking a modelling (sometimes referred to as 'simulation') of the way in which office markets have behaved in recent years, seeking to discover which variables explain the variation in the market values of offices. The modelling itself would be of the type known as 'hedonic analysis' in which an attempt is made to estimate the influence that each of a number of explanatory variables has upon the market price (see Part Two).

Relating property values and their variation over space and time to physical characteristics of properties is a relatively straightforward operation as long as data of sufficient quality and quantity can be made available. To ensure this is the case, use of the data contained in the Investment Property Databank (IPD) would seem to be the most viable research approach⁶.

The possibility may also exist of using data from the Valuation Office Agency in parallel with hedonic analysis utilising the IPD data in order to verify the accuracy of the valuation data supplied by IPD against actual recorded transactions. Analysis of this type would help to overcome the perception that IPD data is tainted because it relies on established valuation methodologies that may or may not adequately reflect the impact of design. IPD recently undertook a preliminary study of this nature with Drivers Jonas.

The problem becomes more complex when variations in price have to be correlated with property features defined in terms of their quality, with the degree of subjectivity this implies, and when a wide range of other fundamental impacts on property value need to be excluded. To overcome these difficulties, the suggested methodology involves five phases that combine qualitative and quantitative research methodologies. The significant qualitative analysis of stakeholder views and aspirations will be used as a means to understand the quantitative evidence and to gauge stakeholder reactions to these findings.

⁶ The involvement of the Investment Property Databank (IPD) directly in the research to provide raw data and to manipulate it for the Bartlett team has been negotiated. IPD will also obtain all necessary permissions from their clients in order to use the data.

A) An analytical framework

The objective of this stage of the research would be to develop two key research tools and consider the range of conceptual problems that the research presents:

1. **A theoretical framework of variables** – The literature review has already identified the difficult conceptual problems concerned with making assessments about both design quality and value. The first task will be to extract from the discussion in Part One and Two (above) and from other literature the theoretical variables that (in principle at least) will impact on economic value. The aim will be to develop a framework of variables that can explain the transfer of design benefits and other non-design factors into investment, development and occupier take-up decisions.
2. **An operational conceptualisation of good design** – Discussion of the range of frameworks for urban and architectural design was also discussed in Parts One and Two (above). From there, and from other related literature, an operational conceptualisation of good architectural and urban design can be extracted in the context of office developments. This will need to be robust and more detailed than in the earlier ‘Value of Urban Design’ research in order to ensure that key architectural and urban design variables can be correlated against economic value. The review has so far generated extensive listings of variables which could be measured or estimated for the subject buildings and then tested as potential explanatory variables in understanding variations in exchange values. This work has tended to emphasise external design issues and urban design considerations while the parallel study by DEGW has been concerned with variables - mainly of internal building design - which influence the productivity and effectiveness of office operations. Both will need to be factored into an operational conceptualisation for the research.
3. **A property selection rationale** – Careful consideration will need to be given to the selection of developments to be analysed, and to the nature of the data required in each case, its consistency, its availability over time, and so forth. Approximately 150 commercial office developments will be selected from the Investment Property Databank, from each of four market areas –
 - the City of London,
 - the West End and Mid-Town areas of London,
 - a set of provincial city centres (Leeds, Manchester, Birmingham, Glasgow, Edinburgh and Bristol)
 - Office parks in the M4 corridor (and possibly parks in the Midlands).

The sample appears likely to be as represented in **Figure 16**:

Figure 16: Possible building samples

Area	Total buildings	5-year record	10-year record
City of London	143	53	20
West End + Mid Town	158	42	22
Provincial capitals	160	38	21
Office parks	-	-	-

The aim will be to focus on modern offices in these centres built since 1980, which have been held as standing investments for at least the last five years. Preliminary discussions with IPD

indicate that this data is available. The selection will deliberately include a range of buildings with different economic profiles, sizes and ages, and will constitute a good regional spread whilst limiting the properties to a small number of regional markets. By this means it will be possible to assess how design effects performance over time, as well as in different market contexts.

B) A performance/quality index

This is perhaps the key research phase, attempting to directly correlate economic performance against design quality, whilst separating these issues from extraneous factors. The objective will be to create a performance/quality index that not only correlates these two 'headline' concerns, but which also evaluates the contribution of design variables, individually and in combination. Six (and possibly seven) stages are envisaged:

1. **Investment performance data collection** – Extraction of investment performance data on the chosen developments – total returns, capital values, rental values, yields, void rate – both existing and historic from IPD.
2. **Design quality data collection** – The research team will visit each development and photograph it to capture its key (external) architectural and urban design characteristics, including its relationship to context. A rough location map and plan form will also be prepared and key features such as the presence or absence of an internal atrium will be noted. This process will take place entirely from the public space bordering each scheme and no internal access will be sought. Other important locational and urban design factors will also be noted such as the relation to transport infrastructure and to public facilities and amenities including shops and important landmarks, the absence or presence of public spaces and important views and vistas, and the absence or presence of other uses within the buildings subject to appraisal.
3. **Expert panel design review** – The classification of each scheme along a continuum from very successful to very unsuccessful, undertaken (with CABEs assistance) using an expert panel to review all schemes. The expert panel will review each scheme based on photographic and other graphic evidence provided by the team. The objective will be to establish an independent and consistent analysis of design quality by a panel selected by CABE, perhaps from the existing Design Review Panel.
4. **Gathering non-external design variables** – With the assistance of IPD, the research team will contact each building owner to obtain further information concerning the internal specification of each development, including the presence or absence of parking, air conditioning, communal spaces, and whether buildings are cellular or open-plan in layout. Information on the nature of the tenant(s) and the covenant is also available as far back as 1998. Confidentiality rules require that some of this data will need to be gathered for analysis by IPD but withheld from publication in forms which could identify individual buildings⁷.
5. **Investment performance and design quality (individual property analysis)** – While IPD cannot release information on the performance of individual offices it can create models for each

⁷ Financial data: this is always complete for each property for the length of time it has been in the database. This is essentially valuation data. Non-financial data is normally present for about 75% of cases and this would need to be completed for the target properties (Parking, building height and dimensions, etc. Since 1998 IPD have been retaining occupier information, which includes information on covenant, vacancies, rent-free periods, actual rents passing etc.

of the market areas which quantify the relationship between different attributes of buildings and their capital value, rental value and equivalent yield at a particular year-end (e.g. end-2003). These models would be based on multiple regression analysis and would quantify the importance of good design and its different dimensions, as well as other explanatory factors such as micro-location, single/multiple occupancy, number of storeys, mixed use, etc. Thus it should be possible to estimate the additional capital value per square metre associated with good design and to identify whether the additional value is due primarily to occupiers (through higher rental values), or investors (through lower equivalent yields), or a mixture of the two.

6. **Correlating take-up data** – Manipulation of the data in a similar fashion to correlate take-up speeds (data available from IPD) with design value. This may supplement the main data series which concern rents, capital values and changes in these two components of return. Steps 5 and 6 will be the subject of a number of iterations.
7. **Testing against Valuation Office Agency data** – will represent a seventh optional phase of the study already discussed above, in order to clarify the validity the IPD valuation data against actual transactions.

C) Qualitative testing

Phase B will inevitably elicit significant quantities of complex statistical data. The objective of Phase C will be to make sense of this data, and to obtain key stakeholder reactions to it. In particular it will be important to investigate not just whether better design adds value, but also which aspects add positively to economic value and which aspects make negative contributions, and in what circumstances i.e. in different market sectors and regions. It will then be possible to explore the reasons for the findings with a range of key decision-makers in a number of selected case studies in each market area. The analysis will represent an attempt to: (i) further interpret the results, and (ii) understand when and why practice departs from the norm.

The findings from the interviews and from the expert seminar suggested that much greater attention was required to this analysis than had been originally envisaged. Three stages will be required:

1. **Establishing intermediate findings** – Synthesis of the complex statistical data and the identification of key findings
2. **Key stakeholder interviews** – Interviews with a range of key stakeholder groups (investors, developers, designers, valuers and occupiers) about their investment and business decisions, in the context of the outcomes from Phase B and the specific investments they are responsible for. A minimum of three such development teams should be targeted for this follow-up qualitative analysis in each market area.
3. **Qualitative/quantitative comparison** – Re-interpretation of the findings from Phase B in the light of the discussions and the drawing of overarching conclusions and recommendations based on the work.

E) Synthesis and dissemination

The final phase of the research would involve the synthesis of findings from the earlier phases and its dissemination in a final report, a conference, articles and other outputs.

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ANNEX A: All studies reviewed:

Dissecting valuation methods and techniques

Study Types:

- A No analysis or proposal of technique to translate observed characteristics to a value-able form
- B Some guidance or suggestion on ways of analysing raw data
- C Black box technique –records *inputs and outputs* only across big sample, inferring conclusions about relationships between inputs and outputs, results can feed into such techniques as multiple regression analysis used in hedonic price method.
- D Studies the *contents* of the black boxes, often testing hypothesis through further detailed (often qualitative) interrogation of data, or gathering of additional data
- E Proposals of practical or experimental methods to *derive a “valuation”* for previously un-valued elements, for example, intangibles such as intellectual capital

Name	Element 1 <i>Observation / Data Collection</i>	Element 2 <i>Assessment / Comparison</i>	Element 3 <i>Communication / Translation</i>	Element 4 <i>Attributing price</i>	Study Type and / or Purpose of tool	Is design the characteristic under investigation ? D = yes
Loe (2000) 2 dimensions of design value: 1. directly measureable economic value 2. value of a “relational” nature, which is a function of views and expectations of different stakeholders as defined through their interaction Cited are four types of buildings that are designed to respond to different requirements identified in 1991/92 study by DEGW and Technibank on Intelligent Buildings in Europe.	N/A	<ul style="list-style-type: none"> – Use Value building – Exchange Value building – Image Value building Business Value building – “use, exchange and image are synthesised into a building where technology is fully exploited to maximise the range of options for the end user”	N/A	N/A	N/A	D
Better Civic Buildings and Spaces (2002) What is a well-designed building?	N/A	<ul style="list-style-type: none"> o Appearance o Context o Buildability o Maintenance o operation 	N/A	N/A	Type A	D
DETR and CABE (2000) – By Design, Urban Design in the Planning System: Towards Better Practice – objectives for urban design:	No specific technique “clear attributes against which success in urban design can be assessed” <ul style="list-style-type: none"> o Character o Continuity and enclosure o Quality of the Public Realm o Ease of Movement o Legibility o Adaptability o Diversity 	N/A	N/A	N/A	Type A Policy	D Urban Design
Urban Design Compendium	<ul style="list-style-type: none"> o a range of spatial relationship / site planning issues o landscape design o movement hierarchy o parking provision o service access o control of vehicle movements o boundary treatment 	N/A	N/A	N/A	Type A Written for English Partnerships by Llewelyn-Davies, architects, urban designers and town planners.	D Urban Design
CABE Design Review: Some alarm bells An “obverse” list, identifying what may result in a “bad” project. From CABE Design Review	<ul style="list-style-type: none"> o Lack of client commitment to quality o Lack of clear brief o Contradictory aims and objectives o Lack of viability 	N/A	N/A	N/A	Type A	D

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These subsume the following, non-comprehensive list of dimensions	<ul style="list-style-type: none"> No understanding of nature of site No evidence of context analysis informing design Mean, pinching, obstructive to the public realm Lack of clarity between public and private Poor and confusing representations / drawings No clear illustrations of project No illustration of project in context No illustration of approach to landscape 					
Vision of Britain (Prince Charles): “10 principles we can build on”	<ul style="list-style-type: none"> Order Clarity of organisation, from site planning to building Expression and representation Appropriateness of architectural ambition Integrity and honesty Architectural language Conformity and contrast Orientation, prospect and aspect Detailing and materials Structure, environmental services and energy use Flexibility and adaptability Sustainability 	N/A	N/A	N/A	Type A	D
Vitruvius’ dimensions	<ul style="list-style-type: none"> Commodity Firmness Delight Order arrangement eurythmy symmetry propriety economy 		N/A	N/A	Type A	D
• Hillier, Musgrove and O’Sullivan’s (1972) four-function model which attempts to capture and classify all their effects:	<ul style="list-style-type: none"> Climate modifier Behaviour modifier Cultural modifier Resource modifier 	N/A	N/A	N/A	Type A Academics	D
• Tibbalds (1988) Commandments for making more people-friendly towns.	checklist	N/A	N/A	N/A	Type A Designer	D Urban Design
• Urban Design Group (1984) – “qualities a good city should possess”	checklist	N/A	N/A	N/A	Type A Designers	D Urban Design
What makes a good building? (RFAC, 1994)	<ul style="list-style-type: none"> Order and unity Expression Integrity Plan and section Detail Integration with neighbouring buildings 	N/A	N/A	N/A	Type A Government agency	D

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Key Principles for urban design (Urban Task Force 1999)	<ul style="list-style-type: none"> Site and setting Context, scale and character Public realm Access and permeability Optimising land use and density Mixing activities Mixing tenures Building to last Sustainable buildings Environmental responsibility 	N/A	N/A	N/A	Type A Government commissioned body to promote urban regeneration, including championing urban design	D Urban Design
Understanding the Context By Design (CABE / DTLR)	<ul style="list-style-type: none"> Urban structure Urban grain Landscape Density and mix Scale Appearance 	N/A	N/A	N/A	Type A Government guidance	D Urban Design
CABE Design Review (2002) Takes a broad view of issues, including some that might be considered non-design, including inception issues. Two sections: <ul style="list-style-type: none"> Project Framework Evaluating Designs 	Provides some guidelines for presentation to CABE panel Broad advice offered on the judgement of design quality Works as a meta-guide making reference to existing guides and checklists. Provides a non-exhaustive checklist on “what makes a good project” including a few dimensions that require interpretation and skilled observation.	N/A	N/A Reliant on design assessors and experts to provide translation.	N/A	Type A Government organisation set up to promote “good” design / this is a guidance document	D
Bottom, McGreal and Heaney (1996, in Haynes et al 2000) <ul style="list-style-type: none"> (1997, in Facilities Vol 15, Nos 7/8 July / August 1997 pp195-203) (1999, in Journal of Property Research Vol 16, No.4 / Dec 1999, pp339-58) <p><u>Objectives of study:</u> To test the “model-ability” of user-based functional performance information with regard to building quality and tenant organisation work practice characteristics data.</p> <p><u>Notes:</u> <i>A building’s functional performance: defined by the interactive relationship between the building and tenant. Measure of a building’s functional performance: degree of match between organisational requirements and design / building characteristics at a particular time.</i></p> <p><u>Definition of design:</u> <i>Concerns physical building characteristics that impact on occupiers.</i></p> <p><u>Usefulness to present study:</u> Although the objective of this study is oblique to present study, it nevertheless throws light on methods and techniques of data collection and modelling.</p>	Two survey tools to collect building data, with aspects of both and . ONE Occupier data The survey tool records: <ul style="list-style-type: none"> occupier data - tenant organisations’ characteristics occupier preference data measurement of the perceived supply and demand of building quality / design factors through standardised Post-Occupancy Evaluation, in 39 dimensions of building quality. TWO Building data <ul style="list-style-type: none"> Expert-based checklist appraisal pro-forma to record physical characteristics of buildings 	<i>See column to left</i> 7 categories are: <ul style="list-style-type: none"> Structure and Enclosure Building Services Building Shell / Common Space Common Access and Circulation Location Amenities Tenants’ Work Environment These are further expanded as follows: Structure and Enclosure <ul style="list-style-type: none"> Amount of floor space provided by the building Typical floor to ceiling height throughout the building Quality and presentation of the exterior of the building Location of lifts, stairs and corridors in the building Building Services <ul style="list-style-type: none"> Control of heating and cooling levels Control of mechanical ventilation levels Control of artificial lighting levels Flexibility of power and IT communication points for changing use 	N/A <i>NOTE: From lessons learnt from this and further extensive regression models, a translation protocol could be developed.</i>	THREE price data A 3 rd survey tool to collect data on price: general building information pro forma structured to gather actual rental and lease data for each tenant from the financial institution owning the property. <i>Note: Not about attributing value, but a method to derive price from design characteristics could be developed from the results of this and further extensive regression models</i>	Type 1 Academic study Facilities and real estate management; Not solely aimed at putting monetary value on property; black box between Steps 1 and 2	

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<ul style="list-style-type: none"> 39 dimensions of design quality for office buildings identified. The statistical approach uses a series of regression models to capture 39 dependent variables summated into 7 dependent variable for regression analysis, with ERV making up an 8th dependent variable for testing purposes. method has brought in ERV into the analysis and tests it as a level 		<ul style="list-style-type: none"> Stability of power supply to the building <p>Building Shell / Common Space</p> <ul style="list-style-type: none"> Prominence / identity of main entrance Draught exclusion at main entrance doors / reception Quality of reception facilities Distance from entrance to lifts or stairs Quality and presentation of finishes used in common space Acoustic control measures in common space areas <p>Common Access and Circulation</p> <ul style="list-style-type: none"> Ease of use / quality of entrance doors for staff and visitors Capacity of entrance doors for staff and visitors Adequacy of disabled access and egress Ease of disabled circulation Capacity of lifts for the movement of staff / visitors Capacity of stairs for the movement of staff / visitors Capacity of corridors for movement Adequacy of goods access and circulation features Ease by which visitors can find directions between the main entrance and offices Security provisions Capacity of on-site carparking <p>Location</p> <ul style="list-style-type: none"> Position of building relative to public transport facilities Position of building relative to public services e.g. shops, banks, hotels <p>Amenities</p> <ul style="list-style-type: none"> Adequacy of sanitary facilities for numbers of staff and other personnel within the building Adequacy of sanitary facilities for disabled staff and visitors Quality of sanitary facilities for staff and visitors Adequacy of catering and vending facilities <p>Tenants' Work Environment</p> <ul style="list-style-type: none"> Ease of staff movement between lifts / stairs and work areas Adequacy of natural light reaching work places Adequacy of measures to control solar radiation or heating effects Adequacy of natural ventilation by means of opening windows 				

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		<ul style="list-style-type: none"> ○ Adequacy of artificial lighting above most work areas ○ Acoustic control measures within the office space ○ Quality and presentation of finishes used in office space 				
CABE (2003) The Value of housing design and layout <u>Objective of Study</u> to assess the extent to which design changes the commercial value of residential development. This was done by assessing the financial return on “innovative” or “PPG3-compliant” mass housing developments and comparing these to the return for “conventional” or non-PPG3 compliant schemes. The conclusions were not conclusive as to whether innovative, PPG3-led schemes is more profitable or not.	Schemes with “exemplary” design were selected based on criteria set out in “By Design” and were also schemes that were widely accepted as exemplar. The By Design criteria are: <ul style="list-style-type: none"> ○ Character ○ Continuity and Enclosure ○ Quality of the Public Realm ○ Ease of Movement ○ Legibility ○ Adaptability ○ Diversity These were matched with nearby “conventional” schemes that exhibited as many similar characteristics as possible to make them comparable. Also, as many site differences as possible were eliminated, and the measure used was “development value / residual value per area of land” as opposed to per unit value.	In effect, little explicit assessment took place to determine how good the design actually was, and the researchers took as given that difference in compliance with PPG3 as sufficient evidence of “design quality”.	N/A	A residual value was calculated by subtracting total build costs from total revenue. This was expressed as residual per hectare, which was then comparable to other schemes. This residual value represents land value, central overheads and developer profit / margin.	Type A Valuers and property consultants Purpose was to produce evidence to demonstrate good design produced good financial returns	
Doiron, Shilling and Sirmans (1992) <u>Objective of study:</u> To uncover any relationship between atrium presence and rental values. A rational series of relationships between rental values, atrium size (and correspondingly leasable floor area) is constructed as a mathematical model.	quantitative floor area data only Takes into account: <ul style="list-style-type: none"> • Lease-specific factors • Market condition factors • Location factors 	<i>See column to left</i>	N/A <i>From lessons learnt from this and further extensive regression models, a translation protocol could be developed.</i>	Data from actual rental values over 5 years	Type 1 Real estate economists	D
Hough and Kratz (1983) <u>Objective of study</u> to determine if the value of “good” architecture (a public good and defined as an “aesthetic” quality) has been internalised by tenants or owners of commercial buildings	Sample of 139 office buildings, but observation of design quality limited to “architectural aesthetics”. Six factors were considered in determining office rent in the CBD. <ul style="list-style-type: none"> ○ Distance from the centre of the CBD ○ Distance from commuting centres (transport) ○ Building responsiveness ○ Amenities ○ Disamenities ○ Quality of architecture (aesthetic) Under the six factors above	By regression analysis hedonic pricing estimation to study buildings that had received architectural awards and thus commanded a significant rental premium that could not be explained by other factors.	N/A	Architectural quality is an attribute for which an implicit price is inferred based on the hedonic function. i.e. the value attributable to architectural quality can be estimated.	Type A / Type D	

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	<p>14 variables were defined. They were:</p> <ul style="list-style-type: none"> - Average rental price - Radial distance from CBD centre - Radial distance to nearest commuter train station - Number of parking spaces within _ mile - Age of building - Gross floor area - Average rentable area per floor - Number of floors in building - Restaurant or not - Conference room or not - Snack shop or not - Elevated train tracks beside or not - Designated a landmark or not - Recipient of specific architectural award or not 					
<ul style="list-style-type: none"> • Property Council of Australia (1999): the Design Dividend project <p><u>Objective of Study:</u> “set out to link good urban design to good financial returns” (www.propertyoz.com).</p> <p>Small number of cases of office development that were widely accepted and also professionally judged to exhibit characteristics of good urban design were examined for investment performance.</p> <p>Report had large descriptive and illustrative element using case studies.</p> <p>Concludes that there is full correlation between the two factors of good design and good financial returns.</p>	<p>This was dependent on responses to a call for nominations nationwide for examples of good urban design in the built environment.</p>	<p>7 urban design criteria developed:</p> <ul style="list-style-type: none"> • high degree of community equity as measured in <ul style="list-style-type: none"> o public space design quality o amenity quality o area accessibility o area vitality o diversity • high level of environmental performance as measured in <ul style="list-style-type: none"> o tangible sustainability results o climatic responsiveness o other environmental improvements • responsiveness to <ul style="list-style-type: none"> o important qualities in the urban and landscape context o valuable historical characteristics • clear relevance to present and future, via high degree of purposeful innovation • ability to change over time <ul style="list-style-type: none"> o positive impact on public life o community perception • professional excellence in all inputs: <ul style="list-style-type: none"> o development concept o planning o architecture and design o facility management and development upkeep <p>expert judgement but based on 7 criteria</p> <p>2d sequence</p> <ul style="list-style-type: none"> • experts requested further information from top 20 sites • best 8 sites chosen 	N/A	<p>Best 8 sites were scrutinised by independent development finance expert via consistently applied steps</p> <ul style="list-style-type: none"> • 5 years performance or over development period • a present value approach using internal rate of return <p>These results were compared with the rest of their respective markets and demonstrated above average returns.</p>	Type A Investors and developers	D Urban Design

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RICS / DOE (1996, in Carmona et al 2001 s3.6)	<p>Trained observations</p> <p>Stakeholder interviews</p> <p>“the assessment was largely undertaken by members of the research team, supplemented by discussions with some of the stakeholders involved in each development.”</p>	<p>Evaluation and observation simultaneous</p> <p>50 urban design considerations under four broad headings:</p> <ul style="list-style-type: none"> Functional and social use Natural environment and sustainability Visual The urban experience. <p>2d</p> <p>Scale 0-4 for each of 50</p> <p>the final outcome being an overall mean average rating for each of the five developments assessed.</p>	N/A	N/A	Type A Valuation	D
<p>Vandell and Lane (1989)</p> <p><u>Objective of Study:</u> To evaluate empirically the nature of the contribution of architectural quality to the value of buildings, to draw conclusions about the behaviour of the design amenity in affecting rents and (property) values.</p> <p>Especially the profitability of design quality for the developer and investor, not just property price.</p> <ul style="list-style-type: none"> 	<p>and detailed evaluation by panel of architects but according to 8 dimensions of quality</p> <p>ONE “Design rating by architects” Design judgements on newly constructed buildings were based on the following dimensions:</p> <ul style="list-style-type: none"> Quality of materials used in the exterior skin Fenestration: composition and scale of the façade Massing: compositional bulk and volumetrics of the building Design of interior public space design of lobby plus other interior public space View of skyline: as seen from a distance Design of exterior public spaces Responsiveness to neighbourhood: relationship to abutting uses Provision of public amenities <p>For rehabilitated buildings:</p> <ul style="list-style-type: none"> Design quality of the original building (prior to renovation) Quality of the rehabilitation Appropriateness of the renovation to the original structure <p>TWO Building data Description of building and site attributes:</p>	Through a series of simple correlations and hedonic analysis	<p>THREE Price data / vacancy data</p> <ul style="list-style-type: none"> Quarterly quoted rent vacancy construction cost operating cost 	3 rd survey tool Quarterly quoted rent and vacancy information	Type A / Type D Academic / designer / business school	D

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	<ul style="list-style-type: none"> Distance to city centre Availability of parking on-site Number of parking spaces within 800 feet of the structure Age of the building Gross square footage of the building Number of floors Whether or not the building has been rehabilitated Date of rehabilitation 					
Baum in “Quality and Property Performance” (1993) Building quality is defined as “resistance to depreciation. This study examines key relationships between the dimensions of quality, depreciation and its two sources: deterioration and obsolescence. Because “depreciation” is linked to “use values” not “exchange values”, this study is not strictly about valuation.	These are the dimensions of <ul style="list-style-type: none"> configuration plan layout floor to ceiling height Internal specification services finishes External appearance Exterior common parts Durability of materials resistance to external deterioration resistance to internal deterioration 	This study simply gleaned data from literature and a brainstorm session. The conclusions from the study concern the reasons for depreciation and thus how building quality can be maintained, since “quality” was defined as resistance to depreciation.	N/A	N/A	Type C	
Diaz 1999 Behavioural Research Behavioural research in the property field begins from the premise that economic constructs of rational man have been abandoned for theories developed in psychology, particularly in human information processing and problem solving. <ul style="list-style-type: none"> Since economic activity is human behaviour, the observation of this behaviour within property decision-making contexts throws new light onto the processes. 	N/A	Techniques foreign to the traditional approach include: <ul style="list-style-type: none"> Controlled experiment Process tracing protocols Field surveys. Evaluative statistics used include: <ul style="list-style-type: none"> Non-parametric or distribution-free statistics Analysis of variance 	N/A	N/A	Type C	
Guy (1998) Although this study is not strictly about relating design quality and exchange value, its approach nevertheless throws light onto a possible qualitative methodology for examining the translation of an observation of a building, its assessment and finally the ascription of value. <u>Objective of study:</u> to develop a clear theoretical sense of the commercial framing of development practices and the consequent fashioning of environmentally sensitive design choices. Studies how the interaction of various actors in the development process (each within their own organisational culture and more importantly, each extracting from the process the different forms of value important to each of them) interact.	N/A	Guy identifies 5 “logics” of innovation, each relating to a different form of environmental value, and emanating from a distinct source of environmental concern. They are: <ul style="list-style-type: none"> community logic – emphasises socially cohesive design comfort logic – encourages design that promotes good health aesthetic logic – expresses a new attitude to nature smart logic – maximisation the efficient use of resources ecological logic – minimise the environmental footprint of the building. These logics may “collide, merge or co-inhabit debate about form, design and specification” (p16)	N/A	N/A	Type C Analytical	Study of development players
Quan and Quigley 1991	N/A	N/A	This article presented “a model of price determination in the real estate market in which property	N/A	Type C	

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			<p>appraisal performs and important, efficiency-enhancing role.... Profit-oriented, but imperfectly informed actors in the market make varying offers to buy and sell properties, leading to a short run equilibrium in which there is some distribution of market prices for identical properties. The role of the appraiser is to provide information so that the variance of this price distribution is reduced" (Quan and Quigley 1991, p140)</p> <p>"The key to the model is the updating rule which the appraiser employs to extract the price signal from the "noisy" transactions made by imperfectly informed actors in the market. This rule specifies the appropriate weighting of the information in a given transaction with the stock of prior information available to the appraiser. This stock of information is the experience and human capital of the appraiser, which forms the basis for signal extraction" (Quan and Quigley 1991, p141)</p>			
Hedonic pricing – welfare economics NOTE SEE ABELSON and other	Large scale sampling from related markets	"Value" is brought into equation early on, before "comparison" (regression) is made to infer value of particular combination of characteristics.	N/A	Price is brought into equation through valuation of related markets. 2	Type D	
<ul style="list-style-type: none"> BREEAM (BRE environmental assessment method) <p>A tool for analysing the environmental performance of buildings</p> <p>Used as:</p> <ul style="list-style-type: none"> property specification tool design tool environmental review tool within environmental management strategies. 	<p>the concept of an Ecopoint</p> <p>1 ecopoint equals, among other things,</p> <ul style="list-style-type: none"> 320kWh electricity 83m2 water: enough to fill 1000 baths 65 miles by articulated truck landfilling 1.3 tonnes of waste Manufacturing _ tonnes of brick (250 bricks) <ul style="list-style-type: none"> carried out by network of registered assessors recognises that assessing various sustainability issues involves subjective judgements about their relative importance. 	<p>Based on the ecopoint, "envest", a design tool has been developed to allow comparison of different buildings for different reasons:</p> <p>As a design-decision support tool, by helping optimise form or choosing construction methods</p> <p>As predictive modelling tool to balance environmental impacts of construction and operation over the whole life of building</p> <p>Assessment tool, either against other buildings or as illustration of sustainability credentials.</p>	<p>The ecopoint is a form of translation from technical to layman's terms.</p> <p>It can also be easily translated into monetary values.</p>	N/A	Type B	D
<ul style="list-style-type: none"> British Construction Industry Awards <p>Mainly addresses construction process, rather than result</p>	<p>should embody the following:</p> <ul style="list-style-type: none"> exceptional standards of architectural or 	N/A	N/A	N/A	Type B	

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Categories: <ul style="list-style-type: none"> • Small project • Building • Civil engineering • Major project • International • best practice 	engineering design <ul style="list-style-type: none"> • innovation • team-work • quality of construction • completion ahead of time and below budget 					
<ul style="list-style-type: none"> • 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). <p>The BRM is based on the synthesis of building supply/organisational demand and the concept that building elements have differing life cycles.</p> <p>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.</p>	Buildings are rated in five sections: <ul style="list-style-type: none"> • Building site and its locational factors • building shell • organisational and work process issues • building occupants • 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.	N/A	N/A	Type B	D
<ul style="list-style-type: none"> • Post –occupancy evaluation Preisner (2002) And special case: <ul style="list-style-type: none"> • Building Use Studies (widely used, since 1985) and PROBE (post-occupancy review of buildings and their engineering) and <p>This is an exercise in benchmarking using Post-Occupancy Evaluation techniques</p> <p>PROBE: extension and enhancement of Building Use studies on the web. building occupant questionnaire on building environment</p> <ul style="list-style-type: none"> • evaluation • Briefing • Diagnostics <p>To ensure buildings are better designed for occupants' wellbeing, lower environmental impact and future investment potential.</p>	PROBE: Incorporates full range of users and contexts, avoiding an average subset 45 variables relating to <ul style="list-style-type: none"> • comfort • health • productivity • perceived control 	Building Use Studies: Benchmarks the results of the 50 most recent studies, which form a questionnaire on its website. Projects being surveyed can be compared by inputting data on website. PROBE: Basis of comparison: "what is actually wanted."	N/A	N/A	Type B Building science research - studies how the occupant of buildings interact and control their environment	D
<ul style="list-style-type: none"> • <i>DEGW Orbit 2 study</i> <p>Developed a methodology for determining the degree of match between the building, the organisation occupying it, and the information technology used.</p>	Building design Occupier organisation IT used	N/A	N/A	N/A	Type B	
<ul style="list-style-type: none"> • Design Optimisation tool (Brian Wood) <p>Provides a visual representation of the optimal profits and costs, linking together customers, suppliers, internal factors to the organisation and financial</p>	Whose profits and whose costs?	N/A	Clearly visualises the optimal profits and costs Suggesting that there is an optimal balance between indicator usage – quality –	N/A	Type B	

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characteristics within a single aim and strategy Allows mass of data to be handled – ideally minimum of 15 -20 measures			cost.			
<ul style="list-style-type: none"> Design Quality Indicator (DQI) (CIC 2002) design quality assessment tool Objective is mainly to provide a common language for multiple stakeholders to discuss design	Engagement of the range of major and direct stakeholders. .	<p>Assessors evaluate the performance of a building against a wide spectrum of attributes collected under three main headings of:</p> <ul style="list-style-type: none"> Functionality Build quality impact <p>their concerns are inbuilt and reflected in the mechanism through weighting, thus partly objectivising the subjective.</p> <p>2d This is usually administered to a group consisting of various participants in the development / design process. it is hoped that this tool becomes more for facilitating a constructive discussion about building quality and less about scoring points</p>	<ul style="list-style-type: none"> a detailed procedure for evaluation and communicating and translating, and not just observation or a mere checklist. use of a graphic device, the spider diagram, which presents an intuitive view of overall building performance. a rounded assessment of building quality 	N/A	Type B Construction Industry Council / prominent architects and engineers – focused on the delivery of buildings	D
<ul style="list-style-type: none"> Housing Quality Indicators (HQIs) <p>Developed by DETR</p> <p>Tool for assessment of potential or existing housing schemes, on quality rather than cost criteria. To provide a common language for housing professionals, design teams and tenants.</p> <p>Does not correlate directly with financial value nor sets out minimum standards.</p> <p>For generic use, in all contexts and at various stages</p>	10 indicators <ul style="list-style-type: none"> Location Site – visual impact, layout and landscaping Site – open space Site – routes and movement Unit – size Unit – layout Unit – noise, light and services Unit – accessibility Unit energy, green and sustainability issues Performance in use 	N/A	N/A	N/A	Type B	
<ul style="list-style-type: none"> Organisational Performance Matrix (Spencer and Winch 2002) <p><u>What is it about?</u> The Balanced Scorecard is adapted as an “asset value matrix”, which is a meta-framework to measure performance of a building in a balanced way. Element 1 components draw on a wide range of other work as possible source of conceptualisations of what value criteria might be.</p> <p>Making “productivity” the ultimate objective of an occupant organisation, both “indoor environmental quality” and “spatial quality” are linked to it.</p> <p>derived from work by DEGW about how building performance contributes to organisational success</p>	<p>The asset value matrix's four quadrants are:</p> <ul style="list-style-type: none"> Financial value <ul style="list-style-type: none"> Capital construction cost Maintenance and running costs Business operating costs (of the occupier organisation) Indoor environmental quality <ul style="list-style-type: none"> Light quality Sound quality Air quality Spatial quality <ul style="list-style-type: none"> configuration structure meaning symbolism <ul style="list-style-type: none"> image branding Public benefit 	Does not elaborate	Presented as the four quadrant “asset value matrix”	N/A	Type B Construction practitioners / consideration of a building as an economic instrument, addressing the lack of attention paid to design investment by market based approaches to property valuation	
RIBA Awards	<ul style="list-style-type: none"> Style Commodity Firmness Delight Does the building work Does it feel right 	<p>Preliminary Assessment: Local and national juries comprising architects and lay people</p> <p>Final stage: Eminent architects decide the award.</p>	N/A	N/A	Type B	D

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	<ul style="list-style-type: none"> Does it stimulate and engage occupants and visitors Should endure as a fine work of architecture throughout its working life. <p>Criteria found in:</p> <ul style="list-style-type: none"> Client briefs planning guidelines summary of construction process used in assessment 	Photographs and visits				
SPeAR A tool for assessing comparative sustainability of usually large building projects <ul style="list-style-type: none"> Can measure sustainability over the whole life cycle of a particular building or structure design or at particular stages of a project Is fully adaptable to other processes and project types Lengthy audit period, up to 3 months developed by Arup 	based on DETR's 15 headline indicators of sustainable development in "Better Quality of Life Strategy for Sustainable Development for the United Kingdom", these are supported by around 150 detailed objectives, which would need to be project-type specific. <ul style="list-style-type: none"> Total output of the economy Total and social investment as a percentage of GDP Proportion of people of working age who are in work Indicators of success in tackling poverty and social exclusion Expected years of health life Qualifications at age 19 Home judged unfit to live in Level of crime Emissions of greenhouse gases Days when air pollution is moderate or higher Road traffic Rivers of good or fair quality Population of wild birds New homes built on previously developed land Waste arising and management 	<ul style="list-style-type: none"> Mainly for use during briefing and concept stage Scoring system Various aspects of sustainability can be compared and balanced Complex interrelationships assessed 	Use of a rose diagram to combine diverse issues, so target areas for improvement can be easily identified.	N/A	Type B	
Urban Design Analytical Tool (Carmona et al 2001)	7 performance related questions referring to 7 urban design objectives: <ul style="list-style-type: none"> Character Continuity and Enclosure Quality of the Public Realm Ease of Movement Legibility Adaptability Diversity 	Strengths and Weaknesses recorded as open-ended for each of the 7 <p>2d Scale 0-5 for each of the 7. These are added up for a total of 35</p>	N/A	N/A	Type B Academic / designer	D Urban Design
Brown 2001	proposes that the best way to evaluate complex designed products such as buildings was by comparison with other responses to the same site (e.g. through architectural competitions), rather than with a fixed list of attributes (e.g. a checklist)	N/A	N/A	N/A	Type B	



The British Council for Offices (BCO) exists to research, develop and communicate best practice in all aspects of the office sector. It delivers this by providing a forum for the discussion and debate of relevant issues.

The BCO works to promote co-operation and understanding between landlord and tenant, investor and developer and owner and occupier, thereby improving efficiency and innovation in the sector.

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Alternatively please contact the BCO at:
38 Lombard Street,
London, EC3V 9BS
Tel: 020 7283 4588 Fax: 020 7626 2223
email: mail@bco.org.uk

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