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## High-tech mixed-use buildings: attitudes to energy efficiency

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An overview is given of a market research study of occupiers and providers of high-tech mixed-use office and industrial developments. Attitudes to energy efficiency and environment, and to building labelling for these features, were examined in relation to the process of building selection and development. This information will be of interest to developers, financial institutions, development agencies, architects, building services engineers, owners, tenants and property agents concerned with this type of building.

### INTRODUCTION

Over the last decade a new building sector has evolved to accommodate the entrepreneurial thrust into new industrial activities. High-tech mixed-use industrial/commercial buildings offer accommodation which is flexible enough to be used either as offices or for light industrial or service operations, research and development, etc. Such buildings are often located on business or science parks and present an image of quality, advanced design, and high standards of environment and services. The Planning Act introduced Business Use Class B1 and is likely to result in such buildings being used more widely as commercial offices alone, in part because of the higher rentals obtainable.

Although this sector is still relatively small (4% of available industrial floorspace) it is growing rapidly and expanding in importance; trends here may, in turn, lead to higher expectations from occupiers of more conventional industrial and commercial buildings. There is potential for a major market-led impact through the association of energy efficiency and working environment in the quality image of the sector. Linking energy efficiency, environment and cost performance to marketability will influence occupiers' building selection and motivate building developers and investors to specify more energy-conscious design briefs. One approach would be to establish an energy/environment labelling scheme for



Figure 1 Example of a two-storey, high-tech mixed-use building



Figure 2 Example of a highly glazed, high-tech mixed-use building

the buildings to assist selection by users. This paper includes general recommendations for the basis of this labelling.

In order to identify the relevant information bases, decision-making processes and attitudes of sector occupiers and building providers, a market research study was commissioned from POLYLINK (Sheffield City Polytechnic; J Henneberry and S Wisler) and managed by the Building Research Energy Conservation Support Unit (BRECSU). Following a review of the information already available, two interview surveys were conducted, one relating to those involved in the supply of these buildings and a more extensive one of occupiers. These surveys are discussed separately, except for the views on building labelling.

### SECTOR BUILDING STOCK

The sector stock floorspace is split between public-sector science-park developments (15%) and the more predominant private-sector high-technology developments (85%). Science parks have more smaller units. Independent single-site companies account for 63% of science-park occupiers but for only 27% of other developments. Whereas science parks are evenly distributed regionally, over 90% of high-tech floorspace is in the south-east of England. Occupiers of both types of development fall within a few high-technology industries with a computing/electronic bias, and pursue similar activities which require mainly office-type floorspace. These activities fall into three groups: high-level services (eg company administration, technical consultancy, research and development), low-level services (eg storage, sales and distribution), and high-technology manufacturing.

The buildings are predominantly of two storeys (Figure 1), fitted to an office standard on the upper floor but left to a shell finish on the ground floor for possible production-type use. Some buildings are highly glazed (Figure 2).

### SURVEY OF BUILDING PROVIDERS

The survey covered 13 representatives of those involved in the provision of high-tech mixed-use buildings in the categories of: developer/traders, developer/investors, investors, investor/developers, property agents, public-sector suppliers, and architects. Structured personal interviews covered: characteristics of their development activity, decision-making process, and attitudes to building specification and provision, energy efficiency, environment and building labelling.

The most active group is developer/traders, although all the other types of developer make significant contributions to supplying the market. Nearly all the interviewees' buildings were located in the south of England. Location was the fundamental determinant of the marketability value of a development. However, developers recognised that occupiers are placing an increasing emphasis on building design.

Sound knowledge of occupiers' requirements is crucial to developers' profitability and mode of operation. Rent/price levels were assessed for the target market and buildings designed to the cost ceilings so established.

All provider groups used financial appraisal techniques which emphasised short-term costs and benefits. Little serious consideration was given to energy efficiency. Such features were rarely incorporated into these buildings as there is no occupier demand for them, and it was perceived that additional costs are involved which cannot be recouped via a rental or price premium.

### SURVEY OF OCCUPIERS

The survey covered a sample of 49 occupiers of high-tech mixed-use buildings. There were 32 in business units, 8 in science-park units, and 9 owner-occupiers. The sample was representative of the major categories in occupiers and buildings (see profile in Table 1). Structured personal interviews covered: characteristics of company and building, decision-making process, and attitudes to building selection, energy efficiency, environment and building labelling.

**Table 1 Profile of occupiers and buildings in survey**

Occupiers		Buildings	
Computing/electronic, etc, industry	69%	Average age (years)	2-3
High quality services	82%	Detached	61%
Manufacturing	10%	Two-storey	55%
10 to 199 staff	74%	Stone/brick built	40%
Highly skilled staff	68%	Highly glazed	20%
Occupational leasehold	52%	10 000 - 50 000 ft <sup>2</sup>	47%
		Office space content (average)	64%
		Air conditioning	47%

### Building selection

The location rather than the building itself was the major factor influencing choice for 67% of occupiers. For 63% the number of buildings considered was 2 to 6, but 44% considered only one in detail. Company needs for up to 5 years ahead were considered by 77% of occupiers.

Almost three-quarters of occupiers made a conscious choice to search only for a mixed-use building, supporting the treatment of such buildings as a discrete sub-sector of the property market.

### Energy efficiency and cost factors

Occupiers considered energy efficiency in itself and energy costs to be relatively unimportant. The level of energy/environmental costs was ranked as the least important of 16 features of a building and could not be immediately estimated by the majority of respondents. Only a small minority of occupiers adopted a budget-driven approach to the determination of their building requirements; the majority established minimal functional requirements and then sought to meet these at minimum cost. For 90% of occupiers able to quantify energy/

environmental costs, these formed less than 3% of total operating costs and less than 15% of building occupancy costs.

Nearly one-third of occupiers had financial criteria for assessing whether to install energy-efficient features in their premises. When selecting their premises, a few occupiers explicitly considered the existence of energy-efficient features (6% of occupiers) or compared the cost-performance of alternative buildings (15% of occupiers), 34% considered energy efficiency indirectly as it contributed to other features, and the remaining 45% did not consider it at all. While occupiers thought energy-efficient buildings more attractive than other buildings, 16% ascribed this specifically to the impact of energy-efficient features on their own (Table 2).

This is not to say that costs generally, and energy costs in particular, are of no account to occupiers. Initial costs (of construction or purchase for owner-occupiers, and fitting-out costs for tenants) and some occupation costs (particularly rent) were ranked highly by occupiers. Most energy/environmental features were considered to add significantly to building capital costs/rents. In addition, active systems, eg for heating and cooling, were considered to add significantly to occupancy costs. Nevertheless, a majority were willing to pay a price/rent premium for energy efficiency (Table 2).

#### Building quality and functional performance factors

Occupiers' attitudes to building quality and functional performance were much more positive. The quality of the internal environment was one of the most highly ranked of building features. The majority of occupiers adopted a function-driven approach to the determination of building requirements. Overall, employee requirements and process/activity requirements were roughly equal in their influence on the quality of buildings' internal environments, but the dominant influence in a particular case was determined by the type of occupier.

While 98% of occupiers perceived a link between staff performance and environmental quality, less than two-thirds saw a similar link between environmental quality and the energy efficiency of the building fabric

and services. Despite concerns with cost, in the case of every active energy/environmental feature, occupiers' most strongly held views related to the beneficial impact of such features on the quality of the internal environment. If specific energy-efficient features were considered during building selection, it was their contribution to other aspects of a building which was most likely to bring them into account. A large majority of occupiers thought that it was the wider impact of energy efficiency which enhanced buildings' attractiveness. Explicit consideration of energy efficiency of particular features was more likely where the occupier was involved in their specification/design.

#### Different types of occupier

Occupiers were divided into different groups defined by both company size (staff numbers) and type/quality of building and activity (percentage of office space content). Some variation in the behaviour of such groups is to be expected given the difference in resources and requirements involved. The occupier survey included information on 21 aspects of occupier opinion or behaviour, an example of which is shown in Table 2.

In the large majority of cases, group responses were in substantial accord with those of all occupiers and showed only differences in emphasis regarding the building selection process, energy consciousness and attitudes to a labelling scheme. Table 2 shows that awareness of the energy efficiency/environmental quality link was least for small companies and for buildings with a low office content. Large occupiers were more likely to find energy efficiency an attractive aspect on its own. Occupiers of buildings with a high office content focused most strongly on the combined effect of energy efficiency and other features. The greater willingness of these two groups of occupiers to pay a price/rent premium for an energy-efficient building is notable.

Of the owner-occupiers in the sample, 45% used a developer or contractor to produce the building to their specification/design. A further 33% managed the overall construction process themselves by hiring technical advisers when necessary, and 22% acquired the premises in completed form.

**Table 2 The attractiveness of energy efficiency (EE)**

Statement	% of occupiers agreeing with statement						
	Company size				Office content		
	All	Small	Medium	Large	Low	Medium	High
Environmental quality and EE linked	63	47	75	69	46	63	74
EE makes buildings more attractive	69	75	69	63	73	68	67
Reasons for attractiveness:							
EE on its own	16	9	9	30	25	17	8
Combined with other features	72	73	82	60	75	58	84
Both reasons important	12	18	9	10	0	25	8
Willing to pay price/rent premium for EE	63	59	40	88	46	56	79

## BUILDING LABELLING

### Attitudes of building occupiers and providers

The aim of a building label covering environmental performance and energy efficiency would be to inform and simplify the building selection process of prospective occupiers through highlighting and relating together these two important aspects of buildings in use. Such a label would need to link the right information on technical, economic and human factors in the right format and be issued by a trusted source. Accordingly, the surveys of building occupiers and providers both included a series of questions on different aspects of labelling.

**Table 3 Percentage of occupiers in favour of various aspects of building labelling**

Label to relate to:		Comparison with related	
Building as a whole	63	building types useful	
Building features	37	(eg offices alone, light industrial)	53
Label format:		Issuing authority favoured:	
Minimum standard	8	Builders/developers	0
Limited score	31	Trade group	4
Extended score	12	Professional body	47
Combination	41	Government body	39
Other	8	Other	10
Supporting information:			
Simple and limited	47		
Extensive/sophisticated	31		
Both levels	22		

The occupiers' views are summarised in Table 3 which gives aggregate results, although there were some differences in degree of emphasis for the different groups of occupiers defined by company size and percentage of office space content. When questioned on the influence that a labelling scheme would have on their future building selection decisions, 96% of occupiers considered that they would be influenced but for 74% only to a limited degree. When occupiers were asked what factor would be most likely to limit the weight given to energy-efficient features in the future, assuming a labelling scheme existed, the following results were obtained: additional costs involved, 25% of occupiers; no evidence of true cost savings, 29%; failure of unproven equipment, 11%; shortage of buildings reduces influence, 25%; other, 10%. This indicates that barriers could arise from both perceptual and market factors.

The responses of building suppliers were similar in overall pattern to those of occupiers. Suppliers were more willing to participate provided a labelling scheme were widely adopted, did not delay completion or occupation, nor imposed any additional costs.

### Recommendations on labelling

The overall results point to the following recommendations on labelling.

- 1 A single labelling scheme would be suitable for all types of occupiers of high-tech mixed-use buildings. The structure and content of the label should be broad and flexible enough to accommodate differences of emphasis.
- 2 The label should relate more to a building as a complete entity rather than to individual features. Equal prominence should be given to cost aspects, focusing on 'value for money', and the wider aspects of energy efficiency. The latter need to emphasise the interrelationships with other building features, particularly the quality of the internal environment.
- 3 Occupiers need a label capable of immediate use and of influencing both stages of building selection, ie initial screening followed by detailed assessment of very few buildings. Therefore, the required format is a simple, limited score, backed up by more complex extended scoring. Similarly, supporting information should include both simple definitions and more sophisticated data. This should stress relative savings for energy-efficient features rather than just absolute running costs per unit area. Details are required also of the impact on building and/or occupation costs (eg construction or fitting-out costs, or higher rents).
- 4 Comparisons of high-tech buildings with conventional office and light industrial/warehouse buildings would be helpful.
- 5 The issuing authority for the label should be independent and technically authoritative, such as an appropriate government or professional body.

## CONCLUSIONS

The decision-making processes of building development and occupier selection are dominated by considerations of location and short-term operational factors as well as market factors. While this does not focus explicitly on energy efficiency *per se*, the contribution which it can make to the quality and appeal of the internal environment is recognised, which suggests that this is a promising route to influence the market.

Current attitudes and perceptions of building occupiers and providers give scope for education towards more informed opinions on energy and environment in buildings. This will require more factual information on building use and performance through case studies of exemplar buildings and wider surveys of energy consumption.

In the longer term, the greatest market impact is likely to be gained by the practical manifestation of a building labelling scheme which provides a readily usable evaluation of a building's environmental performance and energy efficiency.