The boundaries to workplace evaluation

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Abstract

Three separate studies to evaluate occupants' views of buildings and workplaces are summarised, identifying common threads of appearance, comfort / interior environment, configuration and functionality. Configuration can be recast as facets of a workplace that encourage interaction, functionality as facets that introduce distraction or threaten the absence of various support services. Many aspects of interior space can either do one or the other for different groups and different offices, a boundary to be understood and a boundary between survey-based evaluation and action research.

1 Introduction

Understanding of how to evaluate and compare office buildings in terms of users' satisfaction or the impact they have on occupiers business performance remains, in general, poor (Haynes *et al.,* 2001) preventing those who manage them achieving a particular balance between cost and impact. Facilities Management has become a discipline, and industry, dominated by technical issues, building operations and maintenance (Lord *et al.*, 2002), while property managers tend to concern themselves with issues of occupancy cost, rateable and perhaps rental values, unsure if they are comparing like with like.

Hence building evaluation suffers from, *inter alia*:

- a lack of agreement about approach, even within the broadly positivist or survey-based school;
- competing databases, survey instruments and claimed understanding projected by different researchers in the field, each of whom has a different stake; and
- a lack of research comparing design, cultural constructs and productivity.

This paper compares three approaches: one perceptionist survey grounded in asking individuals to express their views as to the contribution various attributes of the workplace make to their productivity and two alternative approaches grounded in an essentially disconfirmationist approach, based on asking for separate views as to the importance of, and users' satisfaction with, various aspects of workplaces and buildings (Table 1). Each arose from research with separate objectives, with methods selected accordingly.

As is apparent from Table 1 these studies together yield a large dataset, with high degrees of internal consistency. What are they telling us and how far can we go in workplace evaluation using such approaches? The first part of this paper provides an overview of each study. This is followed a comparative discussion of the outcomes of the three studies. The final part of this paper draws conclusions and identifies areas for further research.

2 Survey results

2.1 What customers want

Clark and Price (2002) and Clark *et al*. (2003) surveyed two large populations of office workers in UK local authorities, resulting in two independent but reliable data sets. The range of questions was deliberately wide in an attempt to gain a comprehensive understanding of how building occupants evaluate their office accommodation. Both data sets were subjected to factor analysis, a data reduction technique which looks at the extent to which responses to particular questions correlate. A 'factor' is a group of variables which appear to correlate and the analysis develops a correlation

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matrix. The analysis method will always produce such factors and it is a matter of judgement as to whether they are reasonable.

Table 1: Comparison of three approaches to workplace evaluation

Study	Method	Sample size	Buildings	Organisations	Cronbach's alpha
Clark and Price (2002)	Questionnaire survey of perceived importance of 59 aspects of the building and office where respondents work	859	45	16	0.96
Clark *et al*. (2003)	Questionnaire survey of satisfaction with 59 aspects of the building and office where respondents work	1,210	57	24	0.94
Pinder *et al*. (2003)	Focus groups and questionnaire survey to develop instrument for evaluating workplace utility	355	1	1	0.93
	Ongoing research examining relationships between utility, workplace characteristics, occupancy costs and occupant characteristics	940	39	3	
Haynes (ongoing)	Questionnaire survey of perceptions of the influence of 27 variables on productivity	996	26[3]	10	0.95
	Continued use of instrument in ongoing evaluations	2,000+	20+	4	0.88-0.92

The importance and satisfaction surveys were analysed separately, and in comparing the results it must be recalled that there is no expectation of the two answers coming from the same group of people. However, the sample size in each survey support the assumption that representative opinion has been gained. Table 2 reproduces the data from the correlation matrix in a form that permits as close a comparison of the two surveys as possible. It is immediately apparent how consistent the results are. Most variables 'load' in the same groupings in both surveys. Note that the name given are assigned by the researchers.

A number of variables describing attributes of the **customer reception area** are apparent in both samples. In the importance sample all attributes of customer reception facilities co-vary on one factor, that is to say scores on these attributes vary together. In the satisfaction survey, however, three distinct factors are identified concerned with customer reception, its accessibility and its location. The difference seems eminently logical. One can imagine cases where a particular area might be perceived well on one or two of these criteria but less well on the other(s).

The importance sample generated a general **state of the office factor**, embracing cleanliness, tidiness, convenience of toilets and kitchens, and overall comfort. In contrast, the satisfaction sample reveals two separate factors for cleanliness of office and toilets, and cleanliness and location of

[3] Offices rather than buildings

kitchens. It is interesting to note that the cleanliness of windows tends to form part of peoples' evaluation of the cleanliness of the office, whereas it tends to be rated in importance terms alongside building fabric variables. Likewise, wires and cabling are perceived in importance terms as a 'cleanliness issue' but in satisfaction terms are more correlated with views of safety. Finally the catch all term 'overall physical comfort' tends to be interpreted in importance terms with cleanliness and tidiness, but is associated more with fabric and decoration issues when it comes to satisfaction.

The **security** factor has three variables which load in common in both surveys but car-park security, which is evaluated in importance terms as a security variable tends to be perceived as part of car-park satisfaction. Variables concerned with **decoration and appearance of the building** again show a high degree of commonality save for the issues of window cleanliness and personal comfort mentioned above. **Car-parking** is likewise consistent, save for the different perceptions of security in the two surveys.

Issues of **fire safety** (signage and policy) co-vary in the importance survey, with issues of disability access, and surprisingly, with the service from the switchboard. The latter correlation is, however, weak and, at 0.359 might not normally be regarded as significant. In terms of satisfaction fire safety and general signage safety issues co-vary.

Variables concerned with **mail service** are consistent between both surveys with the puzzling, and perhaps not significant loading of toilet location with mail service factors in the satisfaction survey. The data are apparently saying that there is some tendency for peoples' satisfaction with mail surveys to correlate with issues of receiving mail. **Helpline** variables vary entirely consistently and identically in both surveys. Given that other independent research (Price and Clark, 2000) has indicated these same variables to be the determinant of user satisfaction, the result is unsurprising but is welcome confirmation.

Document storage is again consistent. In the importance ratings the availability of meeting rooms also loads in this factor whereas in satisfaction terms the variable loads, more sensibly with other variables concerned with space. The anomaly might merit further investigation. Two variables concerned with **catering service**s again load consistently in both surveys. In the importance survey signage and voicemail also load with catering services. In the satisfaction survey these show more obvious and independent correlations. The availability of outside telephone lines and voicemail correlate, sensibly, in the satisfaction survey.

The availability of, and ability to use, **quiet areas** and issues of **office layout and personal space** appear as separate factors in the importance survey but co-vary in the satisfaction survey. In other research (see section 2.3 below), factors concerning interaction have consistently earned the highest positive results when respondents are asked for views on the impact of workplaces on their personal productivity, and unmediated disruption the most negative. The survey reported here, because it was designed to encompass buildings as well as offices was less specific. In the next phase of the research we will, bearing in mind other research, take these two factors forward separately.

The factors reported in this section have since been developed into a combined building and workplace evaluation tool looking at importance and satisfaction on 18 dimensions. The evaluation tool is being employed in ongoing research into customer satisfaction in local authority office buildings.

2.2 Workplace utility

The overall aim of this study was to develop a statistical model for estimating the utility and occupancy costs associated with different combinations of physical workplace and occupant characteristics. Such a model was deemed to have potential applications in informing facilities managers about the likely impact of changes in the workplace. The term 'workplace' was used in this study to refer to the entire physical environment for work, whether it be an entire floor, building or campus (Brill *et al*., 2001). The concept of 'utility' was taken to mean the 'usefulness' of the workplace (Salway, 1986). According to Williams (1985) occupants form an opinion about the utility of their workplace based on their:

Table 2: Factors and variables for evaluating what customers want

Factor	Variables loading (importance)	Variables loading (satisfaction)
Customer Reception	Good lighting Right temperature Good ventilation Adequate and appropriate seating Standard of decoration inside reception Layout of reception Overall comfort of waiting area Security provision making visitors feel safe Accessibility of its location in building Accessibility of its location in city/town Fire safety i.e. exit routes clearly signed Child friendliness Parking facilities for visitors to the customer reception	Good lighting Right temperature Good ventilation Adequate and appropriate seating Standard of decoration inside reception Layout of reception Overall comfort of waiting area Security provision making visitors feel safe
Accessibility of Reception		Parking facilities for visitors to the customer reception Child friendliness Good accessibility of office premises for disabled people
Location of reception		Accessibility of its location in building Accessibility of its location in city/town
Cleanliness	Cleanliness of toilets Rubbish disposal Cleanliness of office Convenient location of kitchen facilities Cleanliness of kitchen facilities General safety of office e.g. wires/electrical leads not trailing across the floor Convenient location of toilets Overall physical comfort	Cleanliness of toilets Rubbish disposal Cleanliness of office Clean windows
Kitchen		Convenient location of kitchen facilities Cleanliness of kitchen facilities
Security	Personal security in office building Personal security in office Security provisions e.g. door access codes Personal security in Authority's car park	Personal security in office building Personal security in office Security provisions e.g. door access codes
Decoration/ appearance of building	Standard of decoration in office General maintenance inside office State of repair of office furnishings and fittings External appearance/decoration of building in which work Clean windows	Standard of decoration in office General maintenance inside office State of repair of office furnishings and fittings External appearance/decoration of building in which work Overall physical comfort
Control of office environment	Control over artificial lighting Control over natural lighting	Control over artificial lighting Control over natural lighting

	Control over ventilation in office Control over temperature of office	Control over ventilation in office Control over temperature of office
Car park	Accessibility of car park to office Availability of Authority car park Cost of car parking Lighting within car park Disabled car parking facilities	Accessibility of car park to office Availability of Authority car park Cost of car parking Lighting within car park Disabled car parking facilities Personal security in authority's car park
Safety	Clearly signed fire exit routes Fire safety eg Authority's evacuation policy Fire exit being close to normal place of work Service provided by Authority's central switchboard Good accessibility of office premises for disabled people	Clearly signed fire exit routes Fire safety eg Authority's evacuation policy Fire exit being close to normal place of work General safety of office eg wires/electrical leads not trailing across the floor Signage around office building
Mail service	Number of mail collections/deliveries to office each day Timing of mail collections/deliveries Availability of other postal services e.g. recorded deliveries, courier services	Number of mail collections/deliveries to office each day Timing of mail collections/deliveries Availability of other postal services eg recorded deliveries, courier services Convenient location of toilets
Help line	Services is answered promptly and has the capacity to handle several calls without being engaged for several minutes at a time Person who answers is able to handle your query without referring you on to another colleague All repair, maintenance, catering, security, room bookings, audio visual equipment All repair and maintenance related queries	Services is answered promptly and has the capacity to handle several calls without being engaged for several minutes at a time Person who answers is able to handle your query without referring you on to another colleague All repair, maintenance, catering, security, room bookings, audio visual equipment All repair and maintenance related queries
Document Storage	Easy retrieval and sending of documents to storage Provision of document storage facilities Availability of meeting/private rooms	Easy retrieval and sending of documents to storage Provision of document storage facilities
Catering	Catering services provided to staff eg staff canteen Catering services provided if you require them for meetings etc. Signage around office building Availability of voice mail	Catering services provided if you require them for meetings etc. Catering services provided to staff eg staff canteen
Quiet areas and meeting rooms	Ability to work elsewhere if noise levels become too high Provision of quiet areas	Ability to work elsewhere if noise levels become too high Provision of quiet areas Availability of meeting/private rooms Work area/personal space Service provided by Authority's central switchboard
Personal space	Layout of office Work area/personal space	
Telephone Lines	Availability of outside telephone lines	Availability of outside telephone lines Availability of voice mail

- Expectations of what their workplace should be like. Occupants usually have different priorities with regard to workplace attributes, which means that the minimum standard of office accommodation will vary with each occupant; one occupant may expect a high level of environmental control and high quality finishes, whereas others may only expect the minimum level of shelter and security.

- Perceptions of what their workplace is like. Occupant perceptions relate to all aspects of the workplace and are affected by the occupant's characteristics, including knowledge and past experience, time spent in the workplace, personal tastes and social context.

Since the interaction of these two factors may be different for each occupant, a workplace that is unsuitable for one occupant may yield a high level of utility for another (Williams, 1985).

The first stage of the study was to identify the attributes by which occupants evaluate the utility of their workplace. An initial set of scale items were generated through focus groups. Three focus groups, comprising a total of 20 people, were undertaken with occupants of a public sector office building. Participants were asked a series of questions about their workplace, the answers to which generated a total of 87 scale items. The list of items covered a wide range of issues, from tangible ones, such as the standard of information and communications technology, through to more intangible issues, for instance whether the workplace feels bright and airy. Each item formed the basis of two statements: the first to measure occupants' expectations of their workplace; and the second to measure occupants' perceptions of their workplace. Statements were accompanied by a seven-point scale, with anchor labels at points 1 ('strongly disagree') and 7 ('strongly agree').

A pilot study suggested that the number of scale items included in the questionnaire could be reduced from 87 to 55 by combining and deleting certain items. The revised 55-item questionnaire was used to survey 1,800 occupants of a public sector office building. A total of 355 valid responses were received, the data from which were subjected to factor analysis in order to produce a more parsimonious scale and identify underlying dimensions[4]. Data used in the analysis were in the form of difference scores (perceptions - expectations)[5]. Factor analysis of the 55 variables, using principal axis factoring and oblique rotation, revealed 32 variables loaded across 8 factors, representing 62% of the total variance. Interpretation of the results revealed four definable factors, representing 22 variables (Table 3).

The first factor comprised five items relating to the **configuration** of space in the workplace[6]. Items loaded on this factor were concerned with either the amount, accessibility or layout of space. All six items related to common areas rather than individual workspace, for example informal meeting space or space for team projects. The second factor was composed of six items relating to the internal **environment** of the workplace. Items on this factor related to the level of comfort or the degree of control over temperature, humidity and ventilation. The composition of this factor was not surprising, since previous studies had identified these variables as being critical to the evaluation of the office workplace (Leaman, 1995; Leaman and Bordass, 1999; Leaman and Bordass, 2000). This factor also overlaps with the 'control of office environment' factor described in Section 2.1 above.

Factor 3 was concerned with the interior and exterior **appearance** of the workplace. This factor was comprised of five items and is analogous to the 'decoration/appearance of building' factor identified in the previous section. The fourth factor was comprised of six variables that relate to the functionality' of the workplace. This factor included the level of conversational privacy, adequacy of workspace and potential to work free from distraction.

The reliability of the scale was determined by calculating Cronbach's alpha for each of the four factors and for the scale as a whole (Table 3). The resulting values were all high and comparable to those of other scales (Parasuraman *et al.*, 1988; Nelson and Nelson, 1995; Hoxley, 2000). Moreover, a total

[4] See Pinder *et al*. (2003) for a more detailed description of the analysis.

[5] The idea of using difference scores to condense a multiple-item scale is not new and has been used in previous studies (Ford *et al*., 1975; Parasuraman *et al*., 1988; Hoxley, 2000).

[6] Note on labelling of factors.

scale alpha of 0.93 indicated that the scale had very good reliability. A revised survey instrument, containing the 22-item scale and additional questions for identifying sub-groups, has since been used to evaluate the utility of 65 local authority office buildings. The results of the surveys will be analysed in conjunction with data concerning the physical characteristics of the office buildings, with a view to identifying physical characteristics that give rise to particularly 'high' or 'low' levels of workplace utility.

Table 3: Factors and scale items for evaluating workplace utility

Factor	Name	Attribute	Cronbach's alpha
All			0.93
1	Configuration	Access to informal meeting space	0.83
		Amount of informal meeting space	
		Amount of space for team projects	
		Common areas allow chance interaction	
		Layout enables circulation and movement	
2	Environment	Comfortable temperature	0.90
		Comfortable humidity	
		Ventilation	
		Responsiveness to changes in temperature	
		Control over temperature	
		Control over ventilation	
3	Appearance	Looks modern from the outside	0.87
		Modern appearance	
		Visually appealing from the outside	
		Visually appealing	
		Tidy in appearance	
4	Functionality	Conversational privacy	0.87
		A place to work free from distraction	
		Visually privacy	
		Accessible storage space	
		Amount of storage space	
		Amount of workspace	

2.3 Workplace performance

The third study set out to examine occupiers' perceptions of the workplace on their productivity. Recognising the difficulty of measuring 'knowledge worker' productivity, it deliberately chose to test occupiers perceptions of the impact of different variables on their productivity. The authors hypothesised that with knowledge work being largely mediated via different forms of communication, especially conversation, it would be factors in the office which promoted interaction which would be seen as having the most positive impact.

The initial study (Haynes and Price, 2002; 2003) of 996 respondents in 26 offices across 10, geographically dispersed, local authorities. Factor analysis was used as a data reduction method, to establish the underlying conceptual structure of the dataset. It suggested seven factors (Table 4). During 2003 the survey was repeated in four separate organisations, two private corporations and two central government departments[7]. In each case there was an opportunity to survey contrasting workplace designs.

Table 4: Factors and scale items for evaluating workplace productivity

Factor	Name	Attributes	Cronbach's alpha
All			0.95
1	Distraction	Interruptions, crowding, noise, privacy, overall atmosphere	0.85
2	Environmental services	Ventilation, heating, natural lighting, artificial lighting	0.80
3	Office layout	Personal storage, general storage, work area, desk, overall office layout, position of colleagues, circulation space	0.85
4	Interaction	Social interaction, work interaction, physical security, creative physical environment	0.79
5	Flexible space	informal meeting areas, formal meeting areas, quiet areas	0.85
6	Comfort	Décor, cleanliness, overall comfort	0.87
7	Informal interaction points	Position of equipment, refreshment areas	0.57

Cronbach's alpha coefficients were calculated for each factor (Table 4) and support the robustness of most. The component 'Informal Interaction Points' has a relatively low coefficient that is taken as an indication of heterogeneity in the sample and are investigating further.

In subsequent studies the same factors are discernible, though there are differences in the loading of some variables. Circulation space, for example, can be perceived as contributing to interaction in some, but not all flexible workplaces. Work to understand these differences, and the impact of personality, continues.

In all cases between 75 and 80% of respondents state that their workplace is, compared to other influences, an important or very important influence on their productivity. Interaction is universally considered the largest positive contributor to productivity and distraction the most negative. There are examples of successful new workplaces that do receive significantly different ratings. For example, interaction in one is rated by 95% of the responding occupants as having a positive or very positive impact, a figure higher than in other more conventional 'open plan' designs occupied by other units of the same company. In the same example 33% of respondents say that distraction to has a net positive impact, that is they acknowledge the value of the chance interruption. In another case a flexible prototype was rated more highly for interaction than two other more conventional offices in the same building (a high-rise corporate headquarters). In other new workplaces, interaction, while still the most positively rated factor, is no more highly ranked than in more conventional workplaces and the negative impacts of distraction are emphasised. Indeed, in some cases design related variables can be seen as correlating more strongly with distraction than with interaction.

Research examining the reasons for these differences continues. However, the authors can see that where new workplaces receive favourable ratings for interaction, and at least less negative ratings for distraction, firstly all staff are involved and secondly there have been processes of consultation to engage people in the change and develop working protocols for use of the space. The author's

[7] Precise locations cannot be revealed for reasons of commercial confidentiality.

observations confirm precisely the reflections of Laframboise *et al*. (2003) concerning the importance of change management in workplace initiatives. The authors also see that people who would categorise themselves as having a high degree of autonomy and variety in their jobs, that is they would fit Duffy's 'transactional knowledge worker' category tend to be much more positive about their perceived productivity and less especially interaction. However, the authors find that such individuals come from the full range of job categories present in any survey. Transactional knowledge work is it seems a state of mind, a personal construct, more than it is an assignable aspect of a particular job. A connected observation that those who emerge from standard psychometric tests such as Myers Briggs as more introverted and intuitive place less value on interaction and respond more negatively to distraction does caution against adopting one design fits all approaches or at least argues that those involved in workplace management should, where possible, be sensitive to individuals preferred styles of work.

3 Discussion and conclusions

In a previous review (Haynes *et al.* 2001) three perspectives or discourses were identified on property and business performance which did not frequently overlap. The property and real estate, facilities and workplace and business and performance literatures are largely separate. To a certain extent the trichotomy has pervaded the studies summarised here, each of which has been three or more years in the making.

The 'what customers want' programme was largely grounded in the views of operational building / asset managers as to what they thought occupants might find important in judging the buildings they occupied. It did however ask specific questions about perceptions of control of environmental factors, informed by work in the early stages of the workplace utility study. Both the importance and the satisfaction surveys strongly confirmed control as being an important influence. The authors sought to develop a multi-faceted model by which overall satisfaction with a building could be assessed. Work continues to convert the results to a multi-dimensional tool for comparing and benchmarking particular buildings and significant differences are being recorded. The study does suggest a high degree of commonality in the way that occupants evaluate buildings but finer distinctions were apparent when occupants were asked to express their satisfaction.

The 'workplace utility' study was grounded in the views of building users, starting as it did with focus group research to identify occupants' perceptions of how they evaluated the offices in which they worked. It deliberately excluded issues of location in an attempt to understand the functional rather than the locational contribution to building obsolescence. It is an assessment of perceived workplace quality, rather than building quality. It did, however, reveal concerns over attributes of privacy and informal interaction, issues which occupiers themselves raised in the focus groups that were not considered as influences by the building managers. It also identified the issue of perceived control over the environment (temperature, humidity, lighting) being at least as important, to occupiers as actual control.

The 'workplace performance' research was established out of dissatisfaction with other research into workplace productivity which either used satisfaction as a surrogate, or measured productivity in quasi-industrial terms by such measures as papers processed or down time avoided. If, in the modern economy, people are a means of "knowledge production" and, as organisations reflect rhetorically or not in mission statements, such as "our greatest asset", then is the working environment supporting or hindering peoples' work performance? Even if the "greatest asset" rhetoric is actually a no more than a recognition that salaries are often an organisation's largest single item of cost, with space potentially the second largest cost, then are the two major assets of an organisation working together or pulling against each other?

The performance research has now confirmed from a number of surveys the importance of interaction and distraction as positive and, usually but not exclusively, negative influences on reported perceptions. However, as is apparent from Figure 1, behind the different linguistic constructs used in three separate research programmes there is a high degree of commonality in the results. Aspects of a buildings location were only examined in one study. Issues of appearance / comfort appear in all three as do issues of the internal building services (environment in the sense that the word is used here) and particularly control over same. The factor labelled 'configuration' in the workplace utility research is examining similar influences to those contributing to interaction in the performance

research, whereas the functionality factor is examining largely those influences which are seen as 'getting in the way'.

BUILDQUAL	OFFQUAL	OFFPERF
•Location •Car park •Accessibility		
•Customer Reception •Decoration/appearance of building •Cleanliness	•Appearance	•Comfort
•Control of environment	•Environment	•Environmental services
•Workplace amenities •Quiet areas and meeting rooms	•Configuration	•Interaction •Informal interaction points
		•Flexible space
•Security •Personal space •Mail service •Helpline •Document Storage •Telephone Lines •Catering	•Functionality	•Office layout •Distraction

Figure 1: Comparison of survey results

The factor from the performance research which is hardest to match is the one we have labelled as flexible space with, initially, the variables *informal meeting areas, formal meeting areas & quiet areas.* As research continues in other examples the authors are finding that these variables have less consistency in their correlation. They seem particularly susceptible to different constructions by different populations. It should not surprise. Organisations are systems constructed and operated via conversation. Reactions to the places where conversations do, or do not, happen appear to be both a lens into occupants views of office cultures and, especially in situations of impending or recent workplace change, into views of how those spaces were constructed. Subtle, but statistically valid differences take workplace evaluation to the boundaries of what is possible through survey-based research and open the evaluator to an active engagement with processes of change, from evaluation to action workplace research. Much can be gained from quality surveys that at least recognise the existence of the conversational constructs which will be there, but evaluation can become a force for change if it seeks to create space for different conversations.

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