

# Facilities Management: Physical Built Environmental Factors that Influence User Performance in an Office Building

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## Abstract

In a generic sense, all services and core products are delivered to the users in a manmade space called 'facility' that serves the organization to deliver its core business objectives. Effective, efficient and comfortable working environment improves quality of life, wellbeing and perceived satisfaction of the user which improves performance to achieving the organisation's goal. The appropriate configuration of the built environmental factors of a facility helps create a pleasant indoor environment and therefore have influential characteristics to dominate user's productivity and performance.

It is evident that quality of the built environmental factors will encourage users' healthy working style and improve users' wellbeing. Facilities Management of an office building is an integrated approach that maintains, improves and adapts the built environment to support the primary business objectives of the organization. It is about managing user perceived satisfaction and includes the desire to provide a pleasant experience for the users of the facility in order to improve performance. In an organisation (SMEs<sup>3</sup> in the UK), the role of the manipulation of the nature of the facility is one of the primary objectives of a facilities manager for improved user's performance and consequently the overall organizational performance. This research paper therefore aims to identify the key built environmental factors that influence the office building users towards improving their performance in a business enterprise. Quantitative research methodology has been adopted using questionnaires survey tool for this paper. The built environmental factors have been measured by the user on the basis of quality, their perceived satisfaction and the effect on their performance to establish a ranking order of significance.

**Keywords:** Facilities management, users' performance, office building, built environment.

## Introduction

This research paper briefly introduces the facility (facility in the context of this paper is an office building of an SME), facilities management (functionality/operations mechanism) and the built environmental factors (BEFs) that influence users' perceived satisfaction and performance. Literature search regarding the office building, employee's performance, facility management have been carried out to develop an understanding of the relationship between the users and the facility to identify the key BEFs of the facility in an organisational environment. A questionnaire survey has been conducted about the user's perceived satisfaction towards the BEFs and how these factors affect their performance.

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This paper produced a hierarchical list of the built environmental factors established through the questionnaire survey. Targeted participant of this research were users (employees/staff members) of a small to medium business enterprise using office buildings located and operating within the United Kingdom (UK).

COBE and BCO (2005), Codinhoto (2008) and Oseland (2004) have used quantitative methods to study the BEFs affecting users of various facilities. This paper adopts the same quantitative approach. A questionnaire survey had been designed to initially confirm the built environmental factors identified through the literature review. Physical work environment satisfaction questionnaire (PWESQ) and post occupancy evaluation (POE) methods have been used to develop the questionnaire. The questionnaires were sent out using link of an online survey tool (Survey Monkey™) and respondents were asked to answer the questions online. Respondents are the professional office users identified through Facilities Management Association (FMA) and Interserve Plc, UK. 144 responses were received and analysed using Statistical Package for the Social Sciences (SPSS).

## **Literature Review**

### **Facility as an Active Support to the Business**

Frontczak *et al* (2012) states that the contemporary users of the built environment spend 90% of their lives indoors, which leaves a very serious impact on user's well-being and their working performance. In a facility, comfortable working environment plays a vital role to improve efficiency, workability, quality of life, wellbeing and level of satisfaction of a user. A facility serves a common purpose which is provision of work space and the services. Facility is a space where users perform and carry out their routine work activities for operational purposes towards achieving organisational core businesses objectives. As a hosting venue these are developed to fulfil the user's needs, administer plans and to coordinate the corporate activities. A facility is a workspace where the processing actions related to the organisation of the business such as information, planning, filing, designing, analysing, supervising, deciding and broadcasting and communications take place, (Arora, 1980 quoted by Kamarulzaman *et al*, 2011). It provides work space and services to satisfy users' demands and needs in an office building setting, (Tiwari *et al*, 2010) and Seeley (1995). Generically, it serves the organisation as an active support to promote their business, financially enhances the value, quality and the use of the land provides neighbourhood surrounding, and on commercial scale municipal surroundings, (Callaway *et al*, 2008). Most office buildings are used for a specific purpose to promote the image of the business (external expression), and as a medium of relations to other business communities and to support effective and improved internal communication CABA (2005).

Most office buildings in the UK are influenced by the North American construction style which has been argued by a number of researchers as not user oriented and have a very low level of user control over the indoor environment. The user's perception towards buildings has been changed and the buildings are not only use for working place but as a meeting point, Kok and Jennen (2012). Modern office buildings are trendy equipped with new technology. They have become more complex and this new wave demands organisations to pay more considerations to the users of the facility and to the ever changing information technology, IFMA (2012).

A facility provides suitable space with the help of facilities management to make the experience and working activities of the users as smooth as possible.

## **The Facilities Management (FM)**

Facility management is the integration of processes within an organisation to maintain and develop the agreed services which support and improve the effectiveness of its primary activities and user comforts. 1960 is the year when the term facilities 'management (FM) was used for the very first time Wiggins (2011:1). Facilities management reflects the organisations nature and purpose of the businesses. It is an integrated approach to operating, maintaining, improving and adopting the facility and the infrastructure of an organisation in order to create an environment that supports the primary objective of the organisation, Price *et al* (2001). It plays a central role in the maintenance and operation of a facility, Alexander (2007). It encompasses multiple disciplines to ensure functionality of the built environment by integrating people, place, processes and the technology.

Better user performance the facility is attainable with better facilities management system. It is not just the design, layout of the office building which can impact the user performance but the way office building is managed also have its role to play, Haynes (2011) quotes Clements-Croome (2003). Facilities Management can be classed as a quality control department in the facility, an integrated approach to maintaining, improving and adapting the built environment to accurately reflect and to directly support the primary business objectives of the organization. It is about managing users and their perceived satisfaction with an intention and desire to provide them a pleasant experience to gain an improved performance. It is the management of people and the facility, making available resources useful and utilizing them properly, ensuring to make user's experience unique by providing services excellence and making organization's image encouraging and constructive for users and the community.

## **Impact of Built Environment on a Facility User**

CABE and BCO (2005) suggest that the performance measurement of both office building and their users can improve the management process, resource allocations, decision making, better regulations and legislative oversight and accountability. Facilities Management is a management of interaction between user and the facility, and control over the BEFs can leave positive or negative impact on user's which ultimately reflects in the organisational performance, (IFMA). In the facility built environmental factors (BEFs) create indoor environment, and better indoor environment encourage users healthy working style and improve their performance.

Along with physical BEFs there are some non-physical built environmental factors which can be influential on user's performance and cannot be ignored such as, climate change or global warming, gender, culture, religion, etc. Stenberg (1995) Redman *et al* (2009) Wang *et al* (2008) consider that there is a variation of affects depending on the socio-demographic role of the user such as age, qualification or marital status etc, Ajala (2012), Lagoudi *et al* (1996). The most important non-physical BEFs are, new legislation, political/organisational pressure groups, climate change, motivation, relationship with higher management, moral, health and safety, social, self-actualisation, gender, age, religion, sick building syndrome (SBS), etc., Butt *et al* (2013), Redman *et al* (2011) and Wang *et al* (2008). These non-physical environmental factors of a facility are beyond the scope of this paper, therefore will not be discussed any further.

## **Physical Built Environmental Factors in an Office Building**

Healthy working environment encourages healthy working style and reduces absenteeism at work. In a manmade built environment comfortable working environment plays a vital role to improve efficiency, workability, quality of life, wellbeing and level of satisfaction of a user, Fanger (2000). The indoor environmental quality (IEQ) has a major and positive impact on the performance of the office workers, Fanger (2001), and the IEQ should be acceptable to all the users in the office building, Frontczak *et al* (2011), Dorgan and Dorgan (2005) and Ajala (2012). As stated earlier, an office building user spends almost half of their life at their work place, therefore, it is vital to keep a user satisfied with the indoor environmental quality (IEQ), Frontczak *et al* (2011), Dorgan and Dorgan (2005) and Ajala (2012). The built environmental factors make the indoor environment usable and to support users functional tasks. BEFs can be divided into four major factors, i.e., aesthetics, ambient, ergonomics, and services, Codinhoto *et al* (2009), Danielson and Bodin (2009). Chuck and Jeong (2012) add fabric (quality, durability, materials) into this list. Therefore, the major BEFs are; aesthetics (colour, art, layout, design), fabric (façade, surface, quality, durability, materials, lighting, acoustics, temperature, humidity), ambient (acoustic level, noise, air, lighting), ergonomics (furniture layout, IT station, hot desks, offices dimensions, shapes, lay out), and the services (operation, maintenance, accessibility, management, cleanliness, decontamination), Chuck and Jeong (2012), Codinhoto *et al* (2009), Munirathinam *et al* (2011), Vischer (2008). Instead of using BEFs, Leaman and Bordass (2000) use the term '*the killer variables*'. The killer variables have a serious influence on user's perceived satisfaction and performance in an office building and the overall system in the facility. They have identified five variables:

1. perceived comfort and control over personal environment
2. response towards the needs, including comfort
3. ventilation types
4. workgroups and the layout and space plan
5. design (durability, quality, materials used)

## Questionnaire Survey

Comfortable working environment plays a vital role to improve users' efficiency, workability, quality of life, the wellbeing and level of user's perceived satisfaction. Users' satisfaction and experience towards the services provided at work is a growing area of interest amongst the employers, Vischer (2008). The questions asked in this survey were related to the user's personal experience and their perceived satisfaction with the services. This questionnaire survey had a very good response from the industry and many facilities management organisations have shown their interest in the research findings. A hierarchical list of the key BEFs has been established. This is shown in Table presented in the end of this paper. As adopted from Gidado and Akelere (2003) and Frontczak (2011), the Severity Index formula has been used for ranking the BEFs, i.e.,

$$S.I = \sum \frac{R_w W}{R_t}$$

Where:  $R_w$  = number of respondents;  $W$  = weighting or points assigned;  $R_t$  = total number of responses obtained for the variable. Likert scale considered for measure of severity is: no effect = 1, low effect = 2, medium effect = 3, high effect = 4, critical effect = 5

Table 1. List of Built Environmental Factors

Sr. No.	Type	Built Environmental Factors	Response %age	Response Count	Skip ped	Severit y Index
38	Ix. BEFs	Suitable level of lighting to perform your routine activities	76.39	110	34	3.94
30	Ix. BEFs	Air quality (emission of gases, outdoor pollution, dust in the air, moisture etc.)	75	108	36	3.93
29	Ix. BEFs	Fresh air circulation at your work place	75.69	109	35	3.92
43	Ix. BEFs	Overall cleaning and maintenance of the communal facilities and the area	77.08	111	33	3.92
31	Ix. BEFs	Poor ventilation system in the office	76.39	110	34	3.88
39	Ix. BEFs	Communications system to report a fault regarding these factors	75.69	109	35	3.85
32	Ix. BEFs	Poor management and maintenance	75.69	109	35	3.84
4	Ex. BEFs	Traveling time to your work place	85.42	123	21	3.76
24	Ix. BEFs	Furniture suitable, adjustable, rearrange able, re-organisable (in terms of layout and design flexibility in the space)	80.56	116	28	3.76
35	Ix. BEFs	Lighting provided in your office	75.69	109	35	3.75
5	Ex. BEFs	Traveling cost to your work place	84.03	121	23	3.73
26	Ix. BEFs	Individual control over temperature regarding settings/adjusting its level	75.69	109	35	3.73
22	Ix. BEFs	Lay out/setting/ design is suitable to perform day to day activity	81.94	118	26	3.72
25	Ix. BEFs	Central heating and air circulation system (HVAC) in your office	77.08	111	33	3.72
33	Ix. BEFs	Natural lighting in your office	77.08	111	33	3.69
46	Ix. BEFs	Solving the maintenance issues	76.39	110	34	3.67
47	Ix. BEFs	Response handling (response time to rectify the maintenance issues)	76.39	110	34	3.67
17	Ex. BEFs	Building design is suitable for the organisational purpose	86.11	124	20	3.65
23	Ix. BEFs	Enough storage space for your working tools and equipment	81.94	118	26	3.64
34	Ix. BEFs	Artificial lighting in your office	77.08	111	33	3.64
28	Ix. BEFs	Odours in the air	76.39	110	34	3.62
36	Ix. BEFs	Individual control over lighting	76.39	110	34	3.59
42	Ix. BEFs	Provision of tea, coffee, refreshments, etc.	77.08	111	33	3.53
44	Ix. BEFs	Provision of security services	77.08	111	33	3.47
37	Ix. BEFs	Individual control over opening a window to get the natural light	76.39	110	34	3.39
7	Ex. BEFs	Parking space for the building users	82.64	119	25	3.36

Table 1. List of Built Environmental Factors (continued)

Sr. No.	Type	Built Environmental Factors	Response %age	Response Count	Skippe d	Seve rity Inde x
40	Ix. BEFs	Break out areas	77.08	111	33	3.35
48	Ix. BEFs	Acoustics in break out areas (less noisy)	76.39	110	34	3.33
9	Ex. BEFs	Traveling/wait time (waiting time for transport to get to your work)	84.03	121	23	3.31
18	Ex. BEFs	Building facade and shading is suitable to cope with climatic changes	85.42	123	21	3.3
41	Ix. BEFs	Quality of products and services provided in the break out areas	77.08	111	33	3.3
3	Ex. BEFs	Accessibility to public transport	84.72	122	22	3.29
27	Ix. BEFs	Individual control over opening/operating windows	76.39	110	34	3.22
21	Ix. BEFs	Internal Way-finding (to find a room/office) is easy	81.25	117	27	3.21
10	Ex. BEFs	Noisy (outside traffic and other noise pollution of the area)	84.72	122	22	3.19
13	Ex. BEFs	Represent the main business of the organisation	86.11	124	20	3.19
19	Ix. BEFs	Internal layout represent the organisation's culture and values	81.94	118	26	3.19
12	Ex. BEFs	Represent the organisation's culture and values	85.42	123	21	3.11
11	Ex. BEFs	Outside view ( roads, streets, civic centre, etc.)	84.72	122	22	3.1
8	Ex. BEFs	Outside view (surroundings: nature, horticulture, etc.)	84.03	121	23	3.07
6	Ex. BEFs	Way-finding to the building	83.33	120	24	3.04
1	Ex. BEFs	Accessible to local amenities	84.72	122	22	3.01
16	Ex. BEFs	Colour and design of the facade is a depiction of your organisation	86.11	124	20	2.95
20	Ix. BEFs	Colour scheme used inside the building matches the colour of the organisation	81.94	118	26	2.94
15	Ex. BEFs	Aesthetically perfect design	86.11	124	20	2.9
2	Ex. BEFs	In the middle of city centre	84.03	121	23	2.84
14	Ex. BEFs	Office building as an iconic symbol for the community and culture	86.81	125	19	2.84
45	Ix. BEFs	Provision of games/equipment for physical activities in the break out area	76.39	110	34	2.77

Ex. BEFs: External expression of an office building

Ix. BEFs: Internal Expression of the an office building

BEFs: Built environmental factors

Total No of respondents: 144

## Discussion

Literature review identifies almost 48 BEFs in a facility (Sr. No. 1 to 48) as shown in Table 1. An attempt has been made through a questionnaire survey to show the BEFs on a significance scale according to the user's perceived satisfaction and experience. Questions asked in this survey were related to the user's personal experience and their perceived satisfaction with the services. This questionnaire survey had a very good response from the industry and many facilities management organisations have shown their interest in the research findings. Generally, the questions related to indoor environment fetched higher score as compare to other built environmental factors. Previous studies suggested that the satisfaction and performance are critically influenced by the indoor built environmental factors; for example lighting (natural or artificial), HVAC, storage and privacy, external view through the window, etc., Codinhoto *et al* (2008), Sundstrom *et al* (1996), Voordt (2004), Unzeitig and Madhavi (2005). As stated earlier this questionnaire was divided into two sections (i) external expressions (Ex. BEFs) and (ii) internal expressions (Ix. BEFs). Table 1 shows that on the severity index scale external built environmental factors have also gained ranking amongst the top 20 ranking based on the users perceived satisfaction and their experience. The Table 1 shows that Ix. BEFs are not the only key factors that affect the users' perceived satisfaction and performance, but also the Ex. BEFs, time and the cost of traveling to the work place in particular.



Figure 1. A conceptual model of user's perceived satisfaction mechanism

## Conclusion

This paper has achieved three main goals; a list of 48 BEFs as shown in Table 1. This list of BEFs could be useful for analysing physical work environment satisfaction (PWES) and post occupancy evaluation (POE). It presents the top 10 most critical BEFs. This paper has also established that researchers and the facilities managers overlook the external BEFs. However, based on the questionnaire data this paper identified critical external BEFs that cannot be overlooked by the facilities managers at the time of decisions making about the

facility. The ranking of the BEFs may be limited to UK, but the identified key factors should apply beyond the UK as long as it is within an office environment.

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