ELEMENTS OF COMFORT AND SATISFACTION IN THE OFFICE WORKSPACE

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ABSTRACT

The environments in which people work affect their performance. Persons involved in the design of spaces therefore influence work output by the designs and specifications they produce. The highest performance is to be expected from people working in conditions that satisfy their physiological and psychological comfort needs. A survey was conducted in offices in Accra and Kumasi to investigate comfort conditions in the workspace. Office staff indicated their satisfaction with conditions in the immediate work environment. Storage space generates the highest level of dissatisfaction in respondents. Privacy, image of the workplace, and overall environmental comfort are also areas of considerable dissatisfaction. Occupation, far more than age, determines the environmental comfort demands of office staff.

Keywords: *Office environment, satisfaction, comfort deficit, space.*

INTRODUCTION

The workspace is the most important element in office design, because of its potential to influence user satisfaction and performance at work. In as much as it provides the vehicle in which production takes place, it remains a vital factor in the running of a firm. The pursuit of the kind of space most appropriate for production can lead to enormous costs. However, in a bid to cut down space costs, organizations may end up reducing work performance. There is therefore the need to find a balance between the cost of space and its performance value.

The quality of the work environment has a role in increasing productivity. A pleasant environment may increase work efficiency as well as increase the pride of workers in the job and the organisation. The importance of productivity is highly recognized in this information technology society, and this causes organisations to investigate elements of the work environment affecting the capabilities of workers. This study investigates the quality of the environment within which office staff operate in the country. A scale is used to measure the importance workers attach to space factors that influence their performance, and their level of satisfaction with these factors. A comfort deficit index is then developed as a measure of the improvement re-

quired in the factors under consideration. The result is expected to provide useful information for the design and management of office environments that will effectively enhance the productivity of workers.

The Work Environment and Productivity

Physical work conditions are related to worker satisfaction and greatly influence individual work performance and productivity (Sundstrom, 1991). The environmental considerations most vital in planning for personnel include the physical elements of lighting, acoustics, temperature, air, equipment and elements that will add form, finish and colour to space. Factors at work in the physical environment may be considered at different levels under the individual, the interpersonal and the organizational level. The individual level focuses more on direct physical conditions and includes environmental considerations such as the internal microclimate, interior finishes and decorations, sound effects, equipment and furniture design which have direct physiological effects on users of space. The relevant elements generate effects on persons in the form of stress, arousal, distraction and fatigue. The common or interpersonal environment comprises factors resulting from the design and layout of spaces. These include safety, privacy and communication. The organizational environment involves elements affected by organizational policy such as relationships with colleagues, superiors and persons of other departments.

People perceive 80% through their eyes. As early as 1924, Luckiesh observed that performance is best at moderate levels of arousal but deteriorates when arousal is too low or too high. Enhanced illumination improves productivity and decreases work related accidents. Whereas inadequate levels of illumination decrease work performance by causing employees to make more mistakes in their tasks (Ha *et al.*, 2002), illuminances of over 800 lu.. cause discomfort from glare and eye problems (Smith and Bertolone, 1986). Evenly distributed indirect lighting is preferred to direct fluorescent lighting in offices (Paul 2000). Noise can be the biggest problem in the office, and severe stress has sometimes been associated with noise (Paul, 2000). Inadequate protection against intrusive noise can cause severe dissatisfaction in workers (Sundstrom *et al.*, 1994). Noise distraction can reduce performance by interfering with concentration task assignments. Noise reduction in the work environment leads to greater environmental satisfaction, reduced stress symptoms, better communication, a more positive image and even greater attachment to one's organization (Rafaello and Maass, 2002). The body produces heat through metabolic activities and exchanges heat with the surroundings by conduction, convection and radiation, and evaporation. Thermal comfort is achieved when there is a balance between metabolic heat production and heat loss. It is mainly dependent on the thermal environmental conditions and the activity and clothing of the person in that environment. As people will normally spend 90% or more time in buildings, indoor thermal conditions should therefore be acceptable and provide appreciable comfort.

Layout

The physical environment is not the only factor that influences satisfaction and work performance. Other factors that affect work performance are operational and sociological (psychological). The possible combinations and permutations of these factors to meet specific needs are limitless, but the physical setting has a greater effect on the satisfaction of the workers than other factors (Je and Ha, 1996; Wollman *et al.*, 1994). Open office design is negatively related to workers' satisfaction with their physical environment and perceived productivity (Brennan *et al.*, 2002). Space should be allocated in response to the function and types of work performed (Ha, *et al.*, 2002). A properly designed space will, at the same time, increase interpersonal communication and ensure privacy, thus creating the environment for improved collaboration and creativ-

ity. Communication is one of the major factors related to the interpersonal relationships influenced by the furniture and office layout. Each individual takes a role within the organization and works with others to accomplish the set goals of the organization.

METHODOLOGY

A sample of 200 office workers was selected from 10 companies in Accra and Kumasi for the survey. Twenty (20) questionnaires were given to the public relations or research officer of the companies for distribution to their workers. Subsequent visits were made to collect the completed questionnaires after a period of 10-14 days. A total of 148 questionnaires were returned of which 132 were used in the analysis.
The office environment is divided into personal and common spaces. Personal spaces include elements of the environment that individuals use or deal with directly without having to share with other staff. Common spaces are those that are shared with other staff.

The questionnaire was developed on the basis of a study by Ha, Kim, Je and Min (2002) on personal and common spaces in the office environment. The principle had been developed in previous studies on post occupancy evaluation of the workplace (Becker, 1990). Selected characteristics of the work environment were rated on measurements of importance. First, respondents indicated their level of satisfaction with these characteristics. Then they rated them on how importantly these elements contributed to the success of their tasks in the office. This was used as a measure of the expectation (or ideal) for the characteristic (Ha *et al.*, 2002). The deficit, (i.e. the gap between the expectation and the actual satisfaction) was used as a measure of the quality of the space (Weber *et al.*, 1993). The mean values of deficit measure were used for assessment of comfort conditions.

RESULTS AND DISCUSSION

Respondent characteristics

Respondents comprised office staff of which 29.5% were administrative (administration clerical and secretarial), 25.0% were technical or vocational (engineering, technical) and 45.5% were executive/managerial staff. The young group (under 35 years) made up 25.8%, middle age group (36-45 years) was 43.9% and the adult group (46-60 years) made up 30.3%. The average age was 43.4 years ranging from 21 to 60 years. Males constituted 64% while females made up 36%. The length of service of respondents ranged from 5 months to 32years, with an average of 11.2years. Eighty-eight per-cent (88%) were located on the 1st, 2nd and 3rd floors with 4% on the ground floor and 8% spread over the 4th to 8th floors of office buildings.

The mean scores of the space characteristics are presented in Table 1 (by age) and Table 2 (by occupancy). The overall means are given in each table for ease of comparison. A deficit "d" of zero indicates an element that users do not consider important for improvement. Either the element itself is not important or, if important, the level of provision is correspondingly satisfactory. A negative mean indicates an element which has been over-provided for, or is considered over-designed. A high positive deficit value indicates an element that requires serious consideration for improvement.

Comfort Deficit in the work environment

In the personal space, privacy and storage record over 1.0 difference between what was needed and the actual level of satisfaction. The three storage characteristics (amount, suitability and function) scored the highest comfort deficit. The amount of storage for work materials recorded the highest deficit ('d') of 1.26 followed by suitability of storage (d =1.13), and function of storage (d=1.08). The existence of old (often bulky) equipment and the inadequate provision of computers to replace paper files leads to a higher need for storage space. The increasing introduction of computers is set to reduce the amount of space required for the storage of old files. Equip-

Table 1: Comfort deficit in the work Environment: by Age

PERSONAL SPACE	below 35 yrs	36-45	over 46yrs	Combined
	n=34	n=58	n=40	n=132
Amount of work surface	0.57	0.34	0.60	**0.49**
Suitability to work	1.23	0.50	0.52	**0.71**
Arrangement of furniture	0.40	0.25	0.46	**0.36**
Function of furniture	0.55	0.22	0.78	**0.49**
Comfort of furniture	1.05	0.60	1.39	**0.97**
Colour of furniture	0.10	-0.33	0.51	**0.05**
Degree of privacy	0.95	0.86	1.22	**1.00**
Amount of storage for work materials	1.35	1.23	1.22	**1.26**
Suitability of storage	0.95	1.03	1.40	**1.13**
Function of storage	0.95	1.03	1.26	**1.08**
Display areas for exhibits	0.21	0.50	1.14	**0.62**
Image of workplace	0.95	0.87	1.19	**0.99**
COMMON SPACE				
Average size of workplace	0.28	0.24	0.68	**0.33**
Shape of workplace	0.53	-0.37	-0.48	**-0.18**
Location on the floor	-0.51	-0.70	-0.52	**-0.63**
Quality of Lighting	0.57a	0.89a	0.22b	**0.54**
Quality of air conditioning	1.12	0.92	0.89	**0.91**
Quality of noise levels at workplace	0.92	0.80	0.52	**0.68**
Quality of floor finishes	0.65	0.79	1.17	**0.81**
Overall environmental comfort	0.75	0.93	1.32	**0.94**
Overall image of the environment	1.09	0.97	1.00	**0.94**
Density of population in location	0.19	0.74	0.26	**0.39**
Number of meeting spaces	0.24	0.30	0.22	**0.21**
Location of meeting spaces	0.12	0.10	-0.28	**-0.04**
Privacy of meeting spaces	0.22	0.44	0.48	**0.33**
Furniture in meeting spaces	0.79a	0.48a	-0.07b	**0.35**
Size of meeting spaces	0.22a	0.80b	0.57ab	**0.50**
Views from outside	0.13	0.12	-0.17	**-0.03**
Visual effect of co-workers	0.64	0.63	0.65	**0.60**
Relationship between colleagues	0.71a	0.59a	0.04b	**0.40**
Relationship between higher officers	0.89a	0.62a	0.09b	**0.47**
Relationship between workers in other departments	1.12a	0.40b	-0.17c	**0.36**
Av.	**0.62**	**0.52**	**0.57**	**0.53**

Means with same symbol not significantly different at 0.05 level

ment and other work materials may see improvement only slowly, and their storage needs may not change over a long time. Privacy, image of the workplace and comfort of furniture follow next in that order. Privacy recorded the highest deficit in a study by Je and Ha (1996). In that study the amount of storage for work materials scored 0.97 point deficit.

None of the elements in the common space recorded a deficit of over 1.0. The common space thus, does not generate as much dissatisfaction

as the personal space. Overall environmental comfort (0.94) and overall image of the environment (0.94) scored highest in the common space. Respondents have a weak impression of their work environment. The image of one's work environment affects the energy with which one approaches work. Individuals ranking the image of the personal work environment with the highest deficit will not be carrying the highest motivation to work on the average day. There is room for architects, interior designers and furnishing consultants to improve on the quality of their delivery to users. The deficit in overall environmental comfort is significant because office buildings in the study are generally designed and constructed with the services of qualified personnel. If users find these office buildings deficient in overall environmental comfort, it is easy to guess how other buildings, (houses, especially) meet the physical comfort needs of users.

Table 2: Comfort deficit in the work Environment: By Occupation

	Admin	Vocational	Executive	Combined
PERSONAL SPACE				
Amount of work surface	0.19	0.56	0.64	**0.49**
Suitability to work	0.38	0.57	1.00	**0.71**
Arrangement of furniture	-0.34	0.37	0.82	**0.36**
Function of furniture	-0.21	0.41	1.00	**0.49**
Comfort of furniture	0.78ab	0.52a	1.36b	**0.97**
Colour of furniture	-0.23	0.54	0.00	**0.05**
Degree of privacy	0.68	1.16	1.13	**1.00**
Amount of storage for work materials	0.64	1.37	1.60	**1.26**
Suitability of storage	0.86	1.03	1.35	**1.13**
Function of storage	1.01	0.93	1.24	**1.08**
Display areas for exhibits	0.09a	1.38b	0.54c	**0.62**
Image of workplace	0.70	1.06	1.15	**0.99**
COMMON SPACE				
Average size of workplace	-0.23	0.42	0.76	**0.33**
Shape of workplace	-0.11	-0.06	-0.21	**-0.18**
Location on the floor	-0.78	-0.19	-0.69	**-0.63**
Quality of Lighting	0.80	0.34	0.61	**0.54**
Quality of air conditioning	0.90	0.93	1.05	**0.91**
Quality of noise levels at workplace	0.68	0.34	1.00	**0.68**
Quality of floor finishes	0.45	0.95	1.10	**0.81**
Overall environmental comfort	0.24a	1.05b	1.48b	**0.94**
Overall image of the environment	0.57a	1.16b	1.24b	**0.94**
Density of population in location	-0.45	0.51	1.01	**0.39**
Number of meeting spaces	-0.26	0.20	0.65	**0.21**
Location of meeting spaces	-0.32	-0.02	0.23	**-0.04**
Privacy of meeting spaces	0.05	0.53	0.54	**0.33**
Furniture in meeting spaces	0.24	0.17	0.66	**0.35**
Size of meeting spaces	0.24	0.62	0.75	**0.50**
Views from outside	-0.35	0.30	0.15	**-0.03**
Visual effect of co-workers	0.33a	1.06b	0.63ab	**0.60**
Relationship between colleagues	0.50	0.27	0.53	**0.40**
Relationship between higher officers	0.84	0.12	0.56	**0.47**
Relationship between workers in other department	0.43	0.17	0.54	**0.36**
Av.	0.26	0.59	0.76	**0.53**

Means with same symbol not significantly different at 0.05 level

In Je and Ha's previous study 3 out of 16 elements in the common space recorded more than one point deficit. These are noise level, number of meeting spaces and privacy of meeting spaces. In this study, privacy of meeting spaces scored 0.33. Communal privacy is not of paramount concern in an environment where a sizable number of the population still lives in indigenous tenement houses.

Noise is a major source of concern in many office environments (Karasek and Thorelli, 1990). In heavily industrialized environments, background noise can be high enough to distract from common tasks. Respondents in this study scored deficit in the quality of the noise environment rather low (d=0.68). It remains to be learnt for how long office staff will be so tolerant of the noise environment, as industrial and economic activities grow to levels comparable to those prevailing in some of the highly industrialized cities.

Evaluation by different groups

Respondents were grouped by age (Table 1) and occupation (Table 2) to study possible differences within the groups.

Differences by age

Respondents were categorised into 3 age groups (under 35, 36-45, over 45 years) to determine the existence of any difference by age. Quality of lighting, size of meeting places, furniture in meeting places and interpersonal relationships are elements with significant difference by age. The middle age group (36-45years) that may be considered to be the most active group recorded the highest deficit in lighting quality. This is the group that is constantly sorting through tasks and reporting to seniors. The junior age group may be doing considerably intensive visual tasks, but it has physiologically stronger eyesight.

Satisfaction with interpersonal relationships varies considerably with age. The juniors recorded the highest deficit in all three relationship levels, whereas the seniors scored a near zero-deficit in all. This result is affected more by the social environment than the physical architectural space. As staff stay longer in the firm, they become more comfortable relating to others in the office. Also, persons senior in age receive more respect than juniors and are less likely to suffer unpleasant treatment when dealing with others.

Differences by occupation

Occupations are grouped into administrative, vocational and executive categories. The administrative group comprises secretarial, clerical and sales staff. Vocational staff embodies all engineering and technical staff whereas the executive group comprises management staff and directors.

Occupational groups show differences in satisfaction with the overall environmental comfort and overall image of the environment. Administrative staff record the least deficit in both considerations. They are too engrossed in routine duties to worry much over the image and comfort of the broader environment. Deverau, Horan and Maureen (1997) observed that tasks requiring high levels of concentration, (often performed by professionals) are best accomplished in quiet private environments. On the other hand, tasks that are boring and routine in nature (often carried out by clerical staff) are best relegated to open environments with high levels of external stimulation (Mehrabian, 1976). In other words, the more complex the job, the more important is privacy (Sundstrom et al., 1980; Sundstrom et al., 1982). A similar relationship exists between job complexity and the image and comfort of the environment. Executives may be occupying the larger offices with significantly more comfortable provisions, but they still record the highest dissatisfaction with the overall image and comfort of the environment (and even the size of work space). The high expectations for comfort and image that come with executive positions are not adequately compensated for by the enhancement in office comfort conditions.

Significantly, differences in satisfaction with the overall comfort of the environment come by occupation rather than age. Executives also record the highest dissatisfaction with the comfort of furniture. They may stay longer in their seats and have a greater tendency to feel uncomfortable with furniture.

Vocational staff complain more about the visual effect of co-workers than other staff. They may be worried about being watched while working in situations that compromise their sense of privacy. Their jobs are more likely to take them out of their assigned offices into other peoples' offices and are more likely to be interrupted by the presence of other people. Vocational staff also express a far higher need for display areas for exhibits than their counterparts in the office. They always have items of their craft to show.

CONCLUSION

Storage facilities, privacy, overall environmental comfort and image record the highest dissatisfaction in office staff. Design briefs may not reflect the importance of storage needs, but where user satisfaction is among important design criteria, the provision of adequate appropriate storage facility should be given greater attention. The high level of dissatisfaction with overall environmental comfort calls for greater effort from architects and engineers towards the improvement of comfort conditions in offices. Further study on the effect of privacy and image on productivity will help to determine the extent to which designers should pursue user satisfaction in these areas.

REFERENCES

Becker F. (1990). The Total Workplace: facilities Management and the Elastic Organization. New York: Van Nostrand Reinhold.

Brennan A. Chungh J. S. and Kline T. (2002) Traditional versus open office design: a longitudinal field study. *Environment and Behaviour* May 2002 Vol. 34, No. 3. pp 279-299(1)

Devereaux, S.F., Horan H., Maureen F. A. (1997). Indicators of Permanence in Workspace Features: Perceived Importance and Relationship to Workspace Satisfaction. *Canadian Journal of Communication.* Vol. 22, No. 1.

Ha M. Kim H. Je H. Min B. (2002). Office Environment Satisfaction: Focusing on Personal And Common Spaces. *Journal of Asian Architecture and Building Engineering.* Vol.1 No. 2. November 2002.

Je, H. & Ha, M. (1996). A Study on the evaluation of personal and common work environment of offices based on the survey of workers in Seoul. *Korean Institute of interior Design Journal*, no. 7, 3-12.

Karasek, R., & Thorelli, T. (1990). Healthy work: Stress, productivity, and the restructuring of work life. New York: Basic Books.

Leather, P., Pyrgas, M., Beale, D., & Lawrence, C. (1998). Windows in the workplace: Sunlight, view, and occupational stress. *Environment and Behaviour*, 30(6), 739-762.

Luckiesh, M. (1924). Light & Work. New York; Van Nostrand.

Mehrabian, A. (1976). Public places and private spaces. New York: Basic Books.

Paul, R.D. (1996). Building healthy and productive offices. In Haworth, Inc. (Ed.), Ergonomics. Holland. MI: Haworth. (pp. 1-12), .

Rafaello M and Maass A. (2002). Chronic Exposure To Noise In Industry: The Effects on Satisfaction, Stress Symptoms and Company Attachment. *Environment and Behaviour.* September 2002 Vol. 34, No. 5. pp 651-671.

Smith, F.K. & Bertolone F.J.(1986). Bringing Interiors to light. New York: Whitney Library of Design.

Sundstrom, E. (1991). Work environments: Of-