Fidelis Emuze, Humbulani Mashili & Brink Botha

Post-occupancy evaluation of office buildings in a Johannesburg country club estate

Peer reviewed and revised

Abstract

The purpose of this article is to present the findings of a research project aimed at determining the level of satisfaction of building occupants in terms of Indoor Environmental Quality (IEQ) and the effect of IEQ on both the morale and the productivity of the employees working in the complex. The main findings were derived from the perceptions of the employees working in a Country Club Estate (CCE) in Johannesburg, South Africa. The questions asked addressed how poor air quality, lack of access to daylight, unpleasant acoustic conditions, and control over lighting and thermal comfort caused dissatisfaction with the buildings' IEQ. The data were collected during August and September 2012. Questionnaires were sent to ten office blocks within the CCE complex. A total number of 126 questionnaires were sent out and 102 replies were received. Observations from the data led to the view that the satisfactory level of IEQ awareness is low among the occupants and that the employees have limited control over issues such as air ventilation, artificial lighting and noise in their offices. Organisational structure needs to be formed that will enlighten occupants about factors that contribute to poor indoor air quality (IAQ). Organisational procedures also point to the fact that the level of IEQ is low. The inconsistent ratings that were recorded suggest that there appears to be a major scope for addressing post-occupancy evaluation (POE)-related matters in the complex.

Keywords: Buildings, employee morale, employee productivity, facility management, Health and Safety (H&S), Indoor Environmental Quality (IEQ), Post-Occupancy Evaluation (POE)

Dr Fidelis Emuze, Senior Lecturer, Department of Built Environment, Central University of Technology, Free State (CUT), Private Bag X20539, Bloemfontein, 9300, South Africa. Phone: +27 51 507 3661, email: <femuze@cut.ac.za>

Humbulani Mashili, MSc (Built Environment), Graduate at the Department of Construction Management, Nelson Mandela Metropolitan University, PO Box 77000, Port Elizabeth, 6031, South Africa. Phone: +27 41 504 2790, email: <s210255277@live.nmmu.ac.za>

Dr Brink Botha, Senior Lecturer, Department of Construction Management, Nelson Mandela Metropolitan University, PO Box 77000, Port Elizabeth, 6031, South Africa. Phone: +27 41 504 2085, e-mail: <Brink.Botha@nmmu.ac.za>

Abstrak

Die doel van hierdie artikel is om die bevindinge van 'n navorsingsprojek oor die vasstelling van die tevredenheidsvlak van inwoners oor die binnenshuise-omgewingskwaliteit (*IEQ*) en die effek daarvan op die moraal en produktiwiteit van die werknemers in hierdie gebou weer te gee. Die belangrikste bevindinge is afgelei uit die persepsies van werknemers in 'n buiteklubkompleks in Johnnesburg, Suid-Afrika. Die vrae wat gevra is, gaan oor hoe swak lugkwaliteit, gebrek aan toegang tot daglig, onaangename akoestiese toestande en die beheer oor die beligting en termiese gemak lei tot ontevredenheid met die *IEQ* in die geboue. Die data is ingesamel gedurende Augustus en September 2012. Vraelyste is gestuur na tien kantoorblokke in die buiteklubkompleks. 'n Totaal van 126 vraelyste is uitgestuur en 102 antwoorde is ontvang. Waarnemings van die data het gelei tot die siening dat die tevredenheidsvlak van *IEQ*-bewustheid laag is onder die inwoners en dat die werknemers beperkte beheer het oor kwessies soos lugventilasie, kunsmatige beligting en geraas in hul kantore. Organisatoriese strukture moet gevorm word wat inwoners oor die faktore wat bydra tot swak binnenshuise kwaliteit van die lug (*IAQ*) inlig. Organisasieprosedures verwys ook na die feit dat die vlak van *IEQ* laag is. Die teenstrydige graderings wat aangeteken is, dui daarop dat daar klaarblyklik 'n groot omvang is vir die aanspreek van na-besetting geëvalueer (POE)-verwante sake in hierdie kompleks.

Sleutelwoorde: Geboue, werknemermoraal, werknemerproduktiwiteit, fasiliteits-bestuur, gesondheid en veiligheid (H&S), binnenshuise omgewingskwaliteit, na-besetting evaluasie

1. Introduction

Building occupants or employees wish to work in an environment that is conducive to their health and well-being. When these conditions are absent in a work environment, the morale, productivity and performance of employees can deteriorate. In order to address such issues, the idea of Post-Occupancy Evaluation (POE) came into being. POE is relatively new in the built environment in South Africa. A desktop study indicates limited literature in the subject area; even facility management texts failed to provide the needed South African-based knowledge. Thus, an explorative study was conducted in Johannesburg, South Africa to determine the level of satisfaction of the building occupants in terms of Indoor Environmental Quality (IEQ), and then to proffer solutions to identified problems so that the building performance and similar future buildings can be improved upon in terms of IEQ.

2. Post-occupancy evaluation (POE)

POE was established due to problems arising from the building industry, more especially in the care facilities such as mental hospitals, nursing homes, and correctional services (Riley, Kokkarinen & Pitt, 2010: 203). POE is the process whereby a building has to be

evaluated accurately once it has been built and occupied for some time (Carthey, 2006: 58). POE is a general term for a broad range of activities aimed at understanding how buildings perform once they are built, and the level of satisfaction of building users with the environment thus created (Hewitt, Higgins, Heatherly & Turner, 2005: 3). POE was derived from the 'occupancy permit', a document that is issued once the building has been inspected and is declared free from all defects and ready for occupation (Riley *et al.,* 2010: 204).

POE is not a new model; it originated in the United Kingdom (UK) when the British Ministry of Education, in agreement with local governments, first undertook evaluations of buildings in the post-World War II period (Kooymans & Haylock, 2006: 2). The United States of America (USA) followed in the footsteps of the UK, in the early 1960s, with the School Construction System Development in California. Internationally, POE has been endorsed on a longer term basis as a useful addition to architectural practice – the USA serves as an example in this regard (Kooymans & Haylock, 2006: 2). Hence, POE gained momentum in the mid-1960s with an increase in the number of researchers focusing on building design. In time, environmental psychologists developed interests in POE with the aim of focusing on scientific knowledge proliferation (Riley *et al.,* 2010: 204). For instance, Shepley, Zimmerman & Boggess (2009: 17) conducted a POE study at the new location of a 174-person Architectural firm in Boston, USA. The study revealed that occupants were more satisfied with a new building when compared with an older building, although concerns were raised about the impact on indoor air quality, thermal comfort, lighting, noise and office layout (Shepley *et al.,* 2009: 18).

POE is vital, as it reminds corporate executives of the needs of employees that affect their productivity (Kooymans & Haylock, 2006: 3). Such needs are not limited to privacy, lighting, storage and thermal comfort. Providing feedback through POE can also assist the organisation when new ideas and knowledge are put forward for continuous improvement purposes (Lackney & Zajfen, 2005: 23). POE is, therefore, an evaluation tool that is perceived as a sub-process of building performance evaluation and can be defined as the act of evaluating buildings in a systematic manner after they have been built and occupied for some time (Preiser & Vischer, 2005: 8). Once the evaluation is done, it will yield evidence related to different perspectives, reflections and learning (Walker, 2011: 6).

3. Indoor environmental quality (IEQ)

The occupants' well-being and performance are affected by various factors associated with a building. Such factors include indoor air quality (IAQ), temperature, daytime lighting, work space and noise. All these factors have an impact on human health, and could result in employees' low morale and reduced productivity. Quality of work and productivity may be compromised if all these factors are not addressed appropriately. Air pollutants, ergonomics, lighting and temperature may cause a deterioration of health of the occupants of the building (Kamaruzzaman, Zawawi, Pirtt & Don, 2010: 193).

3.1 Indoor air quality (IAQ)

IAQ considers the indoor environment that includes air and comfort factors related to temperature and humidity. IAQ deals with how well the indoor air satisfies the occupants of the building. Inadequate ventilation increases indoor pollutants by not allowing sufficient outdoor air to dilute the emissions from indoor sources. An IAQ problem may originate from office machines, chemical cleaning materials and from occupants themselves. Outdoor chemicals or toxins may also affect the air quality of the office building (Burroughs & Hansen, 2011: 10-12).

These symptoms of poor IAQ may cause health problems such as irritations of the eyes, mental fatigue and headaches. Constant failure to regularly evaluate the building's performance leads to poor IEQ, which may negatively affect the quality of life of the occupants, who will ultimately have to resort to medical treatment (Cho & Lee, 2010: 443). This indoor air problem may lead to the total dysfunction of the organisation if it is not taken seriously at the earliest stage, because it would reduce the productivity of the organisation (Antikainen, Lappalainen, Lonnqvist, Maksimainen, Reijula & Uusi-Rauva, 2008: 79).

Occupants' concentration and work progress may be enhanced due to improvement of the air quality, which would ultimately increase the productivity of the organisation. If air quality is improved in the office, it will reduce absenteeism among employees who are vulnerable to poor IAQ. Joint responsibilities are essential between occupants/employees and stakeholders of the buildings to ensure that improvement of the IAQ is maintained at all times (Creative Department, 2009: 1).

3.2 Lighting

Office work cannot be fulfilled fully without lighting in the building. However, lighting poses certain challenges to human health and will affect the overall service of the employee to the organisation. Most design professionals fail to include lighting requirements at the initial stage, forgetting the fact that this oversight will affect productivity in the workplace if lighting requirements are not met (De Carli & De Giuli, 2009: 1797). The recent technological development of lighting has forced designers to include lighting as a necessity in the office environment, as ineffective lighting may reduce the productivity in the workplace. Having computers in the workplace makes it easier for the occupants to deliver their work more promptly. Office light is supposed to support both paper-based and computer-based work, which makes it difficult for the occupants to adjust the lights to meet both requirements. Light emitted by the computer also contributes some setbacks to the occupants' health if the screen light is not set correctly (AL-Anzi, 2009: 45).

Poor quality of lighting in the workplace will cause eyestrain, which leads to dizziness and stress. Occupants will become disgruntled because of their dissatisfaction with the lights in the building, which will result in reduced productivity. Occupants will start spending long periods away from work to consult a medical expert for treatment of their eyes and/or vision problems (Samani, 2011: 541). Light sends visual messages to the occupants of the building, which could decrease or increase the good mood and motivation levels of the individuals in the building. Quality of lighting in the office building is linked to productivity, because without high-quality lights in the building, the productivity drops (Samani, 2011: 540).

3.3 Thermal comfort

Thermal comfort is that condition of mind, which expresses satisfaction with the thermal environment (Saberi, 2009: 3). The lack of evaluation of buildings regarding the thermal comfort may lead to the occupants' discomfort if the building is too hot or too cold. It is, as a rule, not possible to have the right thermal comfort as occupants of different cultures prefer different air temperatures and, without evaluating this, it would not be known whether everyone is satisfied with the thermal comfort provided to them. If the evaluation of the building is done at certain intervals, occupants are able to choose the type of clothing that is suitable to the temperature of the building (Hassasain, 2008: 214).

AL-Anzi (2009: 48) identifies some effects of high and low temperatures on the occupants in the office. A high temperature causes occupants to become tired, whereas a low temperature makes occupants feel cold. This will have a serious impact on employee productivity if not addressed properly.

Some thermal comfort factors such as air temperature, humidity, radiant heat and air movement may contribute to the symptoms of sick-building syndrome (Saberi, 2009: 4-5). This syndrome produces symptoms such as eye and nose irritation as well as headaches that are associated with the occupancy of the building (McGrath & Horton, 2011: 247).

3.4 Workspace availability and noise

Based on their perceptions, occupants' dissatisfaction may emanate from workspace designs that appear to be poor. The designs must comply with the highest standards of IEQ, which will stimulate the occupants' morale and satisfaction. Employers are thus compelled to create workspace that is flexible and open for movement. Environmental aspects of the workspace must be taken seriously when employers choose workspace, as these may have a serious impact on H&S (Vischer, 2008: 97). Occupants must be given the opportunity to voice their opinion regarding the workspace which they intend to occupy. This will enable the employer to gauge the level of satisfaction regarding the workspace provided to the occupants. It is important that the employer creates a workspace that is suitable for occupants so that they will feel valued and inspired by their employer, and be proud of the work they do. Workspace psychology may play an important part, whereby motivation and commitment could influence occupants to be more productive. Working in an unhygienic workplace will reduce the morale and increase job dissatisfaction among employees (Davies, 2010: 4).

A proper office set-up stimulates interaction between the occupants, which will increase productivity in the workplace. Adequate workspace layout will increase the occupants' concentration and interaction with one another when carrying out work tasks. Sharing of work-related information will also increase the organisational productivity, because experienced occupants will provide assistance to inexperienced occupants (Davies, 2010: 4). There is a correlation between the design of workspace and occupant performance. A well-designed workspace stimulates the occupants' performance, because occupants will always feel

motivated to report to work regularly, unlike having to work in an unplanned workspace (Vischer, 2008: 102).

Office noise, as an indoor environmental factor, disturbs all occupants and can be extremely irritating. Noise can deter occupants from concentrating on their work. Many researchers have acknowledged this, and have produced findings that noise may lead to stress, headaches and other disorders (AL-Anzi, 2009: 44). Designers are obliged to design buildings that include acoustic materials, in order to minimise noise in the office and/or other building environments. An employer should be in a position to select an acoustic office design that will cater for noise control and noise reduction within the workstation. Strategic thinking is required if the employer wants to reduce the noise level, by increasing the room's capacity for absorption, increasing screen height, and increasing the masking of the sound level (Hongisto, 2008: 1). Office wall-panel height must be considered to ensure that at least minimum privacy is maintained, even though it is an open-space office. Work-related information can easily be disseminated among occupants; however, noise in the office building destroys the work flow between employees (Davies, 2010: 8). Office noise can be extremely dangerous as it may cause cardiovascular problems in occupants in the long term (Bluyssen, Aries & Dommelen, 2011: 280). Noise has a negative influence on the occupants' performance, which will have an impact on individual job satisfaction. There is a correlation between the working environment and employees' performance in terms of the physical environment that s/he is sharing in the office. Noise is regarded as one factor that negatively impacts on an employee's performance satisfaction (Danielson, 2008: 532).

3.5 Office productivity and work environment

Productivity in the organisation is also affected by the area in which the building is situated. A well-designed office layout improves productivity, because employees will be motivated to report to work every day if they work in environments conducive to work. Occupants spend most of their time in the office; therefore, well-designed office space must be provided, as this will also increase the organisation's productivity (Goudarzvandchegini & Modaberei, 2011: 74).

Poor air quality may affect the company's productivity when workers are affected by health hazards such as respiratory, skin, nerve, nasal and other related problems. Poor indoor air quality destroys

the workers' morale in terms of reporting to work, which ultimately reduces the organisation's productivity (Antikainen *et al*., 2008: 80).

Management should, therefore, create a work environment that is profitable and productive, and avoid a situation where they work in isolation without interacting with employees. Guidelines for roles and responsibilities must be clearly defined so that morale and production will be higher than management's expectations in firms (Chandrasekar, 2011: 4).

4. Methods

The research design formulated included a questionnaire survey, and the principle of voluntary participation was upheld. This suggests that people were not coerced into participating in the research. Confidentiality was enhanced by keeping participants anonymous throughout the study to ensure confidentiality, and to encourage openness and honesty (Marlow, 2010: 301). The research location for the study was a Country Club Estate (CCE) in Johannesburg, South Africa. The population group consisted of employees of the CCE. The reason for this is that the employees were on the premises most of the time and can testify based on their experiences related to the problems they have experienced in terms of IEQ.

The questionnaires were physically distributed to the respondents who were requested to return the completed questionnaires via the internal mailing system in use. From the 126 questionnaires distributed, only 102 were returned. This resulted in an 81% response rate.

The structured questionnaire was distributed inside ten blocks in the CCE. The questionnaire included six sections (A-F). Section A elicited responses relative to occupants' personal information in terms of age, gender, profession, and term of employment. Section B helped to evaluate the level of satisfaction with the buildings' IEQ. This section addressed the IEQ in the buildings with respect to whether the air in the building is fresh or stale, rate of air circulation, control of ventilation, temperature, thermal comfort and noise, as well as artificial lighting in the buildings. Section C helped to determine whether the building is satisfactory to its occupants. The emphasis was on the interior of the buildings. Section C focused on the lighting in the buildings, access control to the building, and safety. Section D helped to reveal whether the IEQ affects the employees' productivity and performance. Section E assisted in revealing whether office space influences employee performance and productivity. Section F gave an indication as to whether occupants are satisfied with the parking space and access to public transport.

5. Results and discussion

5.1 Indoor air quality

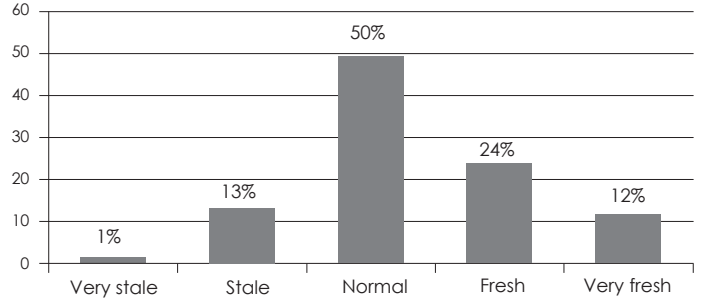

Figure 1: Air freshness or staleness in the building

When asked about how they rate the air within the building, 50% of the respondents mentioned that they rate the air within the building as normal, while 24% stated that they feel the air as fresh, and 13% of the respondents rate the air as very stale, as shown in Figure 1.

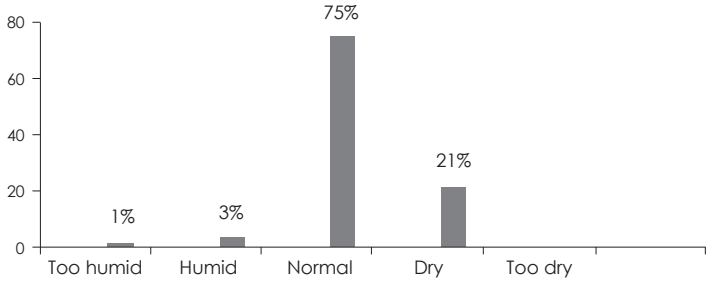

Figure 2: Humidity or dryness of the air within the building

Of the respondents, 75% stated that the air in the building is quite normal, while 21% mentioned that the air in the building is dry; 3% of the respondents stated that the air in the building is humid, whereas 1% of the respondents mentioned that the air in the building is too humid, as shown in Figure 2.

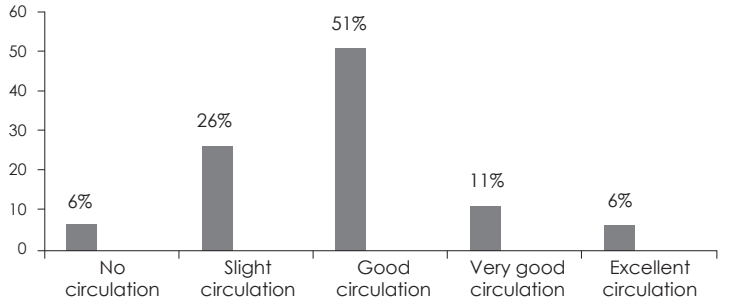

Figure 3: Rate of circulation of air in the building

The findings indicated that 26% of the respondents indicated that there is slight circulation of air in the building, while 6% indicated that there is no air circulation within the building. The results for this question, as presented in Figure 3, revealed that 51% of the occupants perceive that there is good circulation of air within the building, while 11% of the respondents mentioned that there is a very good circulation of air in the building.

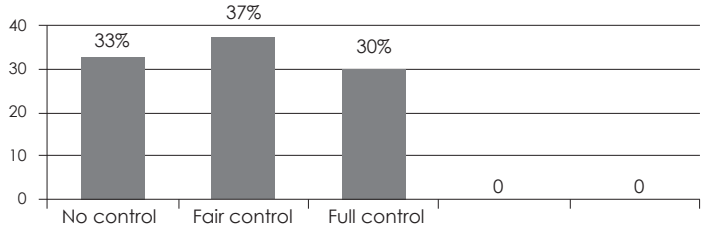

Figure 4: Control of circulation of air in the offices

The results in Figure 4 show that 33% of the respondents indicated that they have no control of air ventilation in their offices, while 37% of the respondents indicated that they have fair control of air ventilation in their offices, and 30% of the respondents mentioned that they have full control of air ventilation in their offices.

Results from Figures 1-3 revealed that the building's occupants can be deemed to be satisfied with the indoor air quality.

5.2 Lighting

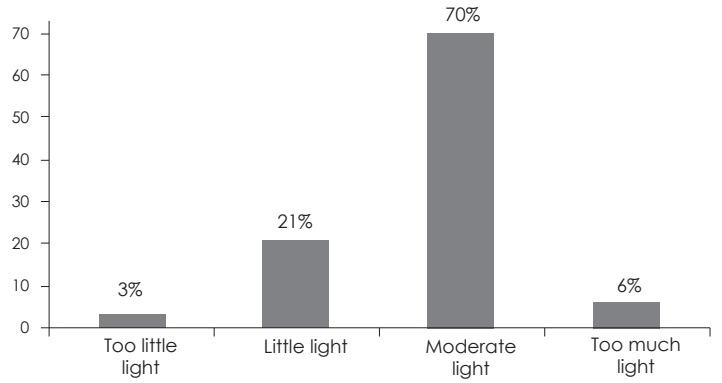

Figure 5: Natural light in the building

Figure 5 shows that, of 102 respondents, 70% indicated that there is moderate natural light in the office building; 21% of the respondents also suggested that there is little natural light, while 6% of them contended that there is too little light in the office building.

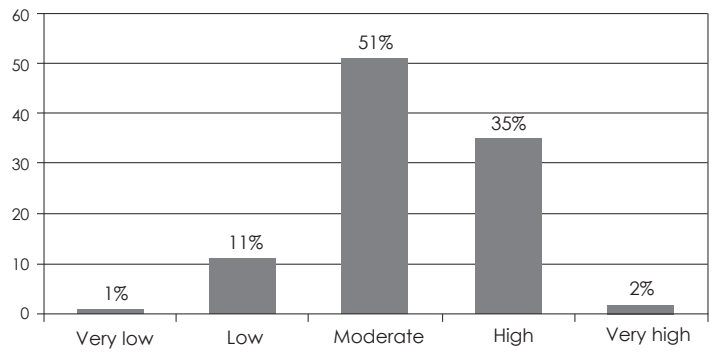

Figure 6: Artificial light in the building

The survey result showed that 51% of the respondents indicated that there is moderate artificial light in the building, while 35% indicated

that there is high artificial light in the building; 11% of the occupants responded that there is low artificial light in the building, while 1% of the respondents mentioned that there is a very low artificial light in the building, as shown in Figure 6. This may imply that, while most occupants may not have experienced eyes-related health challenges, some may have challenges with eye diseases in the building due to artificial light.

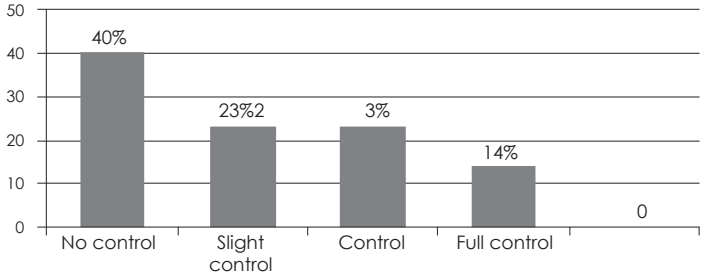

Figure 7: Control over artificial lighting in the building

Of the respondents to whom the questionnaires were distributed, 40% indicated that they do not have control over artificial lighting in their offices in the complex; 23% of the respondents indicated that they do have control over artificial lighting in the office complex, while 14% mentioned that they do have full control over artificial lighting in the complex. The survey revealed that 23% of the respondents indicated that they do have slight control over artificial lighting in the office complex, as shown in Figure 7. The results related to the control over lighting supports the fact that lack of control over certain aspects of the building's IEQ leads to dissatisfaction related to IEQ of buildings.

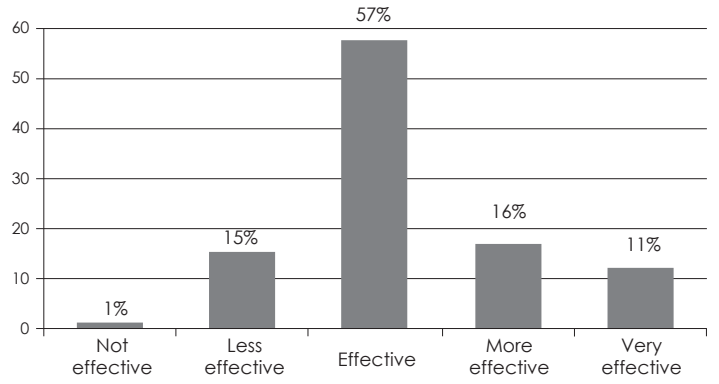

Figure 8: Effect that blinds/shutters may have on blocking out natural light in the building

Results in Figure 8 reveal that 57% of the respondents mentioned that there are effective blinds for blocking out natural light, while 15% of the respondents stated that blinds or shutters are more effective for blocking out natural light; 11% of the results show that blinds are very effective in blocking out natural light in the building.

5.3 Thermal comfort

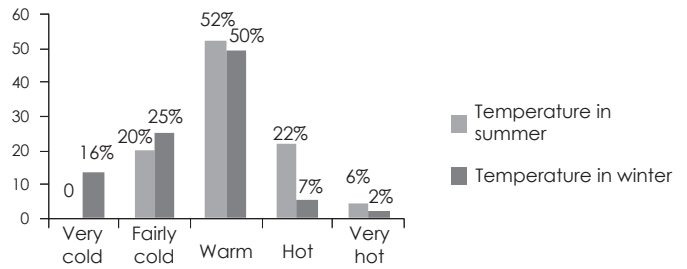

Figure 9: Perceived room temperatures in summer and winter

From the 102 respondents, 52% of them indicated that it is warm during summer in their offices, while 22% mentioned that it is hot during summer in their offices. However, 6% of the respondents indicated that it is very hot during summer in their offices. The findings in Figure 9 show that 50% of the respondents indicated that it is warm

during winter in their offices, while 16% indicated that it is very cold during winter; 25% responded that is fairly cold during winter, while 7% of the respondents indicated that it is hot during winter. This suggests that there is no proper control of thermal comfort within the office building, which could lead to dissatisfaction with regard to the IEQ. This also gives an indication that the majority of the occupants would not be vulnerable to diseases such as influenza during the winter season; however, they would be exposed to health challenges during the summer season when the temperature is not supposed to be lukewarm.

5.4 Workspace availability and noise

Table 1: Satisfaction regarding space planning

	Response (%)		
	Office space flexibility	*Parking space*	*Accessibility of public transport to office complex*
Not satisfied	10.0	11.0	29.0
Less satisfied	23.0	15.0	23.0
Satisfied	28.0	28.0	32.0
Fairly satisfied	19.0	17.0	12.0
Very satisfied	20.0	29.0	4.0
Total	100.0	100.0	100.0

The survey results in Table 1 show that 10% of the respondents indicated that they are not satisfied with space flexibility at their workplace, while 23% of the respondents indicated that they are less satisfied with it; 28% of the respondents also mentioned that they are satisfied with the flexibility of space provided, while 19% of the respondents are fairly satisfied. Of the total respondents to whom questionnaires were distributed, 11% of them indicated that they are not satisfied with the parking space provided in the complex, while 15% of them indicated that they are less satisfied. The findings revealed that 28% of the respondents indicated that they are satisfied with the parking space in the office complex, while 29% are very satisfied with it. From the findings shown in Table 1, 29% of the respondents suggest that they are not satisfied with the accessibility of public transport from Country Club Estate, while 23% of the respondents indicated that they are less satisfied; 32% of the respondents are equally satisfied with the accessibility of public transport, while 4% are very satisfied with the public transport accessibility to the office complex.

Table 2: Satisfaction with the condition of the building

	Response (%)				
	Office	*Training room*	*Canteen*	*Boardroom*	*Reception*
Poor	3.0	5.0	15.0	3.0	4.0
Average	17.0	27.0	21.0	22.0	23.0
Good	45.0	35.0	33.0	33.0	31.0
Very Good	22.0	24.0	21.0	25.0	26.0
Excellent	13.0	9.0	9.0	15.0	16.0
Total	100.0	100.0	100.0	100.0	100.0

Table 2 reveals that an average of 3% of the respondents indicated that the poor state of the office, boardroom and reception, while 21% of the respondents rated them average. An average of 36% of the respondents rated office, boardroom and reception as good, while 24% rated very well in office, boardroom and reception area.

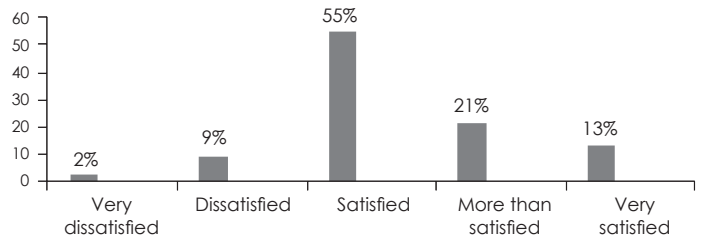

Figure 10: Extent of occupants' satisfaction concerning safety in the building

Figure 10 shows how occupants in the complex rate the level of satisfaction regarding the safety in the building. The survey result reveals that 55% of the respondents are satisfied, while 21% of the respondents are more than satisfied with the safety of the building; 9% of the respondents are dissatisfied with the safety of the complex, while 2% are totally dissatisfied with the safety of the building.
Given the aforementioned, it can be concluded that occupants are not satisfied with space flexibility of the building, while the majority of the respondents are satisfied with the safety of the building.

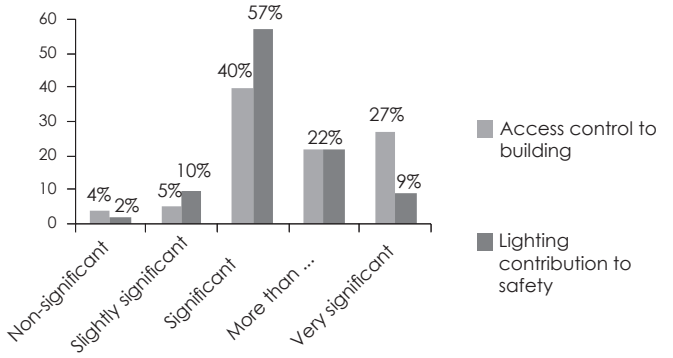

Figure 11: Control of access to the building

Results in Figure 11 show that 40% of the respondents indicated that it is significant to have access control to the building, while 5% indicated that it is slightly significant to have access control to the building. The survey reveals that 22% of the respondents indicated that it is more than significant to have access control to the office building. In addition, 57% of the respondents indicated that it is significant to consider lighting when assessing the safety of the working environment, while 22% indicated that they consider light as more than significant.

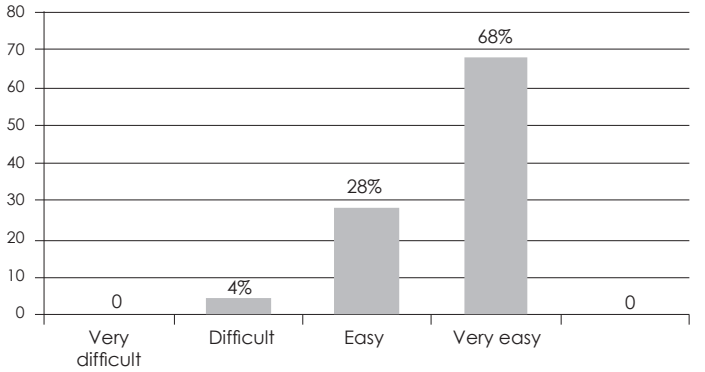

Figure 12: The ease of movement within the building

Of the respondents, 4% indicated that it is difficult to move within the building, while 28% of the respondents indicated that it is very easy

to move within the building; 68% of the respondents indicated that movement within the building is very easy, as shown in Figure 12.

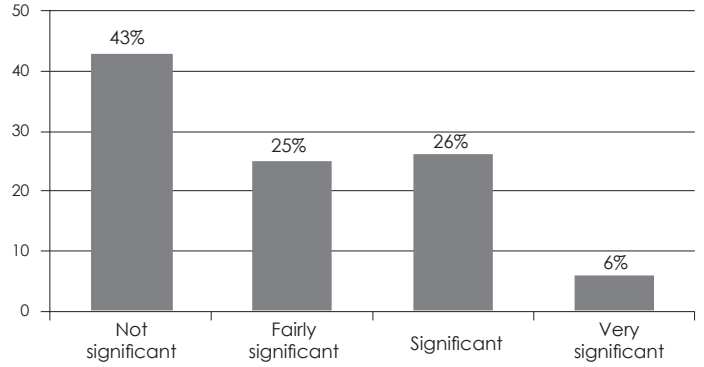

Figure 13: Noise pollution from outside the building

Of the respondents, 26% indicated that they hear external noise that leads to significant distractions, while 25% of them do not hear such external noise, as shown in Figure 13; 43% of the respondents mentioned that external noise is not significantly distracting them from work, while 6% opined that external noise does affect them very significantly when executing their work. These results support the postulation that unpleasant acoustic conditions lead to building occupants' dissatisfaction with regard to building IEQ.

5.5 Office productivity and work environment

Results in Table 3 show that 36% of the respondents indicated that distraction from noise affects their performance and productivity in their firms, while 23% of the occupants mentioned that noise distraction has some effect on their performance and productivity; 16% of the respondents stated that noise distraction affects their productivity and work performance, while 7% indicated that noise distraction has a major effect on them. The survey shows that 29% of the respondents stated that noise level has a minor effect on their work performance and productivity, while 32% of the respondents mentioned that noise level has some effect on their work performance and productivity.

Table 3: IEQ effects on occupants' productivity and performance

	Quality of light	*Distraction of noise*	*Noise level*	*Quality of air*	*Temperature in office*	*Quality of space provided*
Minor effect	37.0	36.0	29.0	31.0	27.0	36.0
Near minor effect	16.0	18.0	9.0	17.0	13.0	8.0
Some effect	27.0	23.0	36.0	28.0	30.0	27.0
Near major effect	13.0	16.0	13.0	12.0	16.0	15.0
Major effect	7.0	7.0	13.0	12.0	14.0	14.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

When asked whether quality of air has an effect on employee performance and productivity, 31% of the respondents indicated that the quality of air has a minor effect on their performance and productivity, while 28% viewed the effect to be moderate. A small percentage (12%) of the respondents also indicated that the quality of air contributes significantly to their work performance and productivity. Furthermore, 27% of the respondents contended that the temperature in the office has a minor effect on their performance and productivity, while 30% maintained that the temperature in the office has some effect; 16% of the respondents indicated that the temperature in the office has a near major effect, while 14% mentioned that the temperature has a major effect on their performance and productivity.

6. Conclusion

From the foregoing, it can be concluded that the satisfactory level of IEQ awareness is low among the participants. Organisational structure needs to be formed that will teach occupants the factors that contribute to poor IAQ. Organisational procedures also point out that the level of IEQ is low. Similarly, 22% of the respondents complained that the temperature in their offices is hot during summer, while 20% complained that the temperature in the office is fairly cold during summer. This inconsistency suggests that the temperature issue has not been addressed in a manner that suits the occupants of the office complex.

It can be concluded that inadequate IEQ can lead to poor work performance among occupants. This can be substantiated by the following findings indicating that 27% of the respondents opined that the quality of light has some effect on their work performance, while 13% indicated that it has a near major effect on work performance. However, only 23% indicated that noise distraction has some effect on work performance and productivity; 28% of the respondents also

replied in the negative relative to quality of air by saying that it has some effect on occupant work performance, which leads to poor productivity. Although 30% of the respondents indicated that office temperature does have some effect on their work performance, the findings reveal that 14% of the occupants perceive that temperature could lead to decreased work performance and productivity.

There seems to be a lack of control of noise in the office building, as the majority of the occupants complained about the distraction from other office cubicles. This suggests that the management of the estate complex is not proactive in terms of combating noise, which leads to discomfort among the occupants, during working hours. The fact that there is moderate natural light in the building shows that there may be design-related inadequacies pertaining to the complex. The fact that occupants do not have control over artificial light in the building creates a major threat to human eyes in the long run.

Based on the findings of the research, it can be concluded that POE is new to the employees working at the CCE. This can be substantiated by the fact that the perceptions of occupants with regard to IAQ, which poses health challenges within the building, were not satisfactory.

7. Recommendations

This exploratory study shows that office buildings should be constructed in a manner that is environment friendly; meets occupants' IEQ requirements, and supports their activities. Evaluating IAQ in the office building is very important with the intended goal of ensuring that air pollutants, which are harmful to the human body, do not emerge in buildings.

With regard to the way forward, employers in the complex should endeavour to handle employee satisfaction as an aspect of their organisational culture, so that it can be addressed from time to time. The management of the complex should start applying POE and, in the process, emphasise the rewards that employees and employers would realise. The management of the complex could hire a task team that involves health practitioners, in order to investigate the cause of IAQ problems. This would reduce the rate of absenteeism among employees who have experienced discomfort by way of headaches, nausea, dizziness, and eye irritation.

Designers and other stakeholders should persuade one another to use building materials that have low emissions to minimise

the potential development of air pollutants. Ventilation systems that are in need of maintenance must be serviced regularly to avoid occupants inhaling stale air which puts occupants in an uncomfortable situation.

Lighting systems that are used in the office building should comply with the indoor lighting requirements to avoid a decrease in performance when it is too dim or too bright. If lighting in the office building is used according to POE, this may save as much energy as possible, as results may improve organisational productivity. To improve privacy in workstations, designers should increase the wall height of partitions, which may also reduce the noise from adjacent workstations. For natural lighting to penetrate more successfully into the buildings, designers should evolve more options when designing or altering existing buildings.

However, given the limitations and challenges that were encountered in the course of this research project, the findings should be interpreted in this context only. In order to unearth far-reaching perspectives and contribute substantially to knowledge, a future multidisciplinary research is recommended. The future study could entail the use of more than one case study as its unit of analysis.

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