



**BUILDING
PERFORMANCE
EVALUATION OF OFFICE
COMPLEXES IN
FEDERAL POLYTECHNIC, BIDA,
NIGERIA**

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Abstract

Human spends most of their lives inside buildings, then it is fundamental to note how well buildings match users' needs, and identify ways to improve building design, performance and fitness. Building performance Evaluation (BPE) is a prominent tool that indicates satisfaction and comfort level needs of building occupants in a building facility. This research therefore, studies BPE of the office building in the Federal Polytechnic, Bida with specific reference to the Administrative Block (AB) and School of Art and applied Sciences (SAAS) buildings. Data were sourced through the distribution of 2 (two) sets of questionnaires known as Occupants' Survey Forms A and B. various key indicators of performance and indoor environmental features of the buildings were studied and analyzed. The study was based on key group variables such as the physical, functional and performance indicators of the office facility.

Quantitative techniques were used for the research through purposive sampling and investigative approach method was adopted in choosing administrative block and

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school of art and applied science which constitutes a large population of office accommodation in the Polytechnic. Data collected for BPE are analyzed using statistical analysis. However, improvisation and complaints are not necessarily the result of bad design. They could be the result of an outdated

concept of design and/or lack of proper building facility maintenances. The research hereby recommend that all construction players should prioritize application of BPE as strategic level decision making and emphasized as continuous activity in environmental evaluation towards sustainability of building assets..

Introduction

Building Performance Evaluation (BPE) is a systematic and rigorous approach encompassing a number of activities including research, measurement, comparison, evaluation, and feedback that take place through every phase of a building's lifecycle including: planning, briefing/programming, design, construction, occupancy and recycling. BPE focuses on the relationship between design and technical performance of buildings in relation to human behavior, needs and desires (Shauna, *et al* 2012). Tim (2013) advocated that there is clearly a moral, ethical and ultimately a professional responsibility to those who produce these buildings, as clients, designers and contractors to ensure that they function well and that there are no unintended negative consequences.

A building has a specific role in the life of man as it is one of man's basic necessities of life after food in the ranking of his greatest wants (Rob and Jack, 2011). At the most fundamental level, the purpose of a building is to provide shelter for activities that could not be carried out as effectively, or carried out at all, in the natural environment. Buildings are designed and constructed to (1) provide interior space whose configuration, furnishings, and environment (temperature, humidity, noise, light, air quality, materials) are suited to the activities that take place within. (2) Provide the infrastructures like water, electricity, waste disposal systems, fire suppression necessary to carry out activities in a safe environment and (3) protect people and equipment from elements such as wind, rain, snow, and heat (Federal Facilities Council, 2001);

Building Performance Evaluation (BPE) involves the review and analysis of buildings and assessment of the extent to which a building meets its design intent, performance targets and occupant satisfaction. The central purpose of BPE is to improve in-use performance of building and design practice. In a study by Iyagba (2005) found out that people spend about 90% of their lives in a built environment. It follows that if human spends most of their lives inside buildings, then it is fundamental to note how well buildings match users' needs, and identify ways to improve building design, performance and fitness. Building performance has a strong integration within building users. This is because, they are the people who

measure the level of performance that lead to customer satisfaction and increase the building occupancy rate, and therefore there is need for building performance evaluation (BPE).

Building performance evaluation (BPE) involves the inspection of buildings one to five years after their completion, and assessment of the extent to which a given building has met its design goals for resource consumption and occupant satisfaction. It is pertinent to know that the purpose of BPE is to improve design practice and to ensure the continuous improvement of design methods, through the provision of feedback to designers on the effectiveness of their design choices.

It could be argued, however, that as each building is individually designed feedback from completed buildings, particularly those of similar function located in comparable environments (geographical, social, financial and so on) would routinely be sought to inform the design of subsequent buildings and thus to improve these designs. This is not the case as good buildings often go unnoticed while poor building performance is often not publicized (Leaman, *et al.*, 2010). The result is that the same mistakes are repeated and the process of improvement that occurs in manufacturing is seldom duplicated in the design and construction of buildings. To achieve an optimum feedback Emerald Group Publishing Limited (2010) illustrate the process of building performance evaluation considerations in figure 1 below:

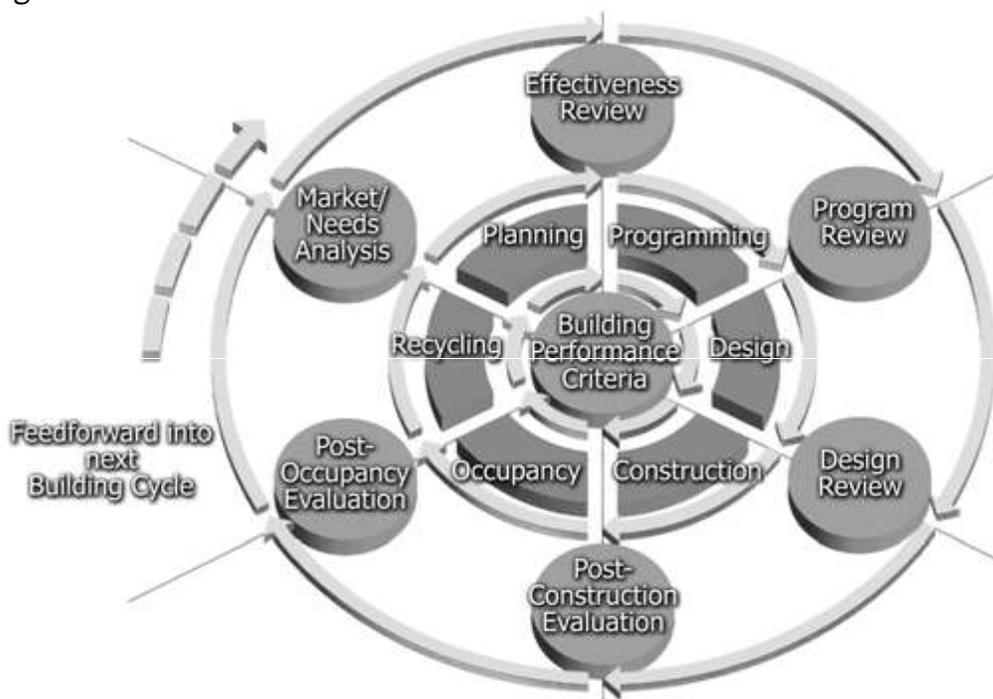


Figure 1: Building Performance Evaluation Considerations

Source: Emerald Group Publishing Limited (2010)

BPE provides enormous potential for improving the performance of a building. BPE evolved to fill the gap in the conventional building process, which consists of planning, programming, design, construction and post occupancy of a building (Ilesanmi, 2010). There are no appraisal and feedback of the office structures in terms of functionality and performance. Hence, there is a dearth of knowledge on the functionality and performance of the office facility. More so, data or information on the users' needs and satisfaction of office complexes are unavailable for use.

This paper therefore provides a leeway and background study into the Performance Evaluation of Administrative Block (AB) and School of Art and Applied Science (SAAS) office buildings within the Federal Polytechnic, Bida. The two structures are selected since they accommodate significant number of staffs, and the type of information the research sort to seek for will be achieved in these two buildings.

STATEMENT OF THE PROBLEM

Office complexes have been designed, constructed and occupied for decades without evaluation. There is therefore a dearth of knowledge and information on the user satisfaction, indoor environmental features and key performance indicators of the office facility. This can be traced to lack of data and available information that give feedback to the design process and post occupancy office management, an oversight of the performance evaluation of office facilities. This oversight can or could have resulted to inadequate planning by management in terms of staff enrollment, deployment and occupation of the completed structures, budget performance, overall employee satisfaction as well as regular maintenance of the office complexes. This therefore forms the basis for this research.

RESEARCH QUESTIONS

Various research questions were review and answers provided during the research work. The questions include:

- iii. What are the user satisfactions in the internal performance evaluation of the buildings?
- iv. How do the users feel about the BPE of the external environment?

RESEARCH OBJECTIVES

The major objective of this research is to conduct BPE of office buildings in The Federal Polytechnic, Bida with specific reference to the Administrative Block (AB) and the School of Art and Applied Sciences (SAAS) Complex Building.

The objectives are as follows:

- i. To identify the various aspects of indoor environmental features of BPE and establish a bench mark upon which future performance evaluations would be based.
- ii. To assess the user satisfaction of the AB and SAAS Complex Building of Federal Polytechnic, Bida.

METHODOLOGY

The research design formulated in carrying out the study will follow the design approaches below:

The Expository Approach: This approach includes detailed review of literary works from journals, papers, documents, and internet searches, of various authors on BPE of related building facilities via the secondary source. This approach is purely based on existing information and data obtained from secondary sources.

The Investigative Approach: This research approach includes a detailed investigation and sourcing of BPE data on the institutions on office Complexes via the primary sources using a purposive sampling technique. The technique is selected because the group is believed to likely give the credible data that will be used for the research. The sourcing of primary data is undertaken as follows:

- i. Collection of data on occupant's survey of indoor environmental quality.
- ii. The use of structured questionnaires to various groups of the population study.

The principle of voluntary participation was upheld. This suggests that people were not coerced into participating in the research. Confidentiality will be enhanced by keeping participants anonymous throughout the study to ensure confidentiality, and to encourage openness and honesty (Marlow, 2010).

STUDY POPULATION

These include samples population group A and B upon which the sampling size are drawn or selected in the course of data collection. For the purpose of this research work the population of study shall be restricted to the following category and population: Population group A: About 60 (Sixty) academic and non-academic staff in the Administrative Block building and 40 (Forty) academic and non-academic staff in SAAS Complex building. This population includes senior ranking officers and junior officers in both building.

Results

The research results are presented in statistical form and information collected from field survey for analytical purposes in order to achieve findings to correlate with the research objectives. Data from field exercise carried out in the office Complexes are sourced through the distribution of two sets of questionnaires; Occupants' Survey Forms A and B, for staffs using the facilities.

The Occupants’ Survey Form A and B are distributed to sample size of 40 - 60 drawn from population strength of the Staff occupying the office complexes in the study area, using the Bouely’s formular. The research laid more emphasis on the staff occupants of the complexes as they spend more time in the complexes using the facilities of the buildings more than any other persons in the institutions

$$n = \frac{N}{1+N(e^2)} \quad (1)$$

Where n = Sample Size

N = Population

e² = Margin of error (assumed 5%)

1 = Unity or Constant

The result obtained from the descriptive analysis was summarized in tabular form for clear understanding. The decision on the results of the descriptive analysis was based on the class ranged shown in the Table 1. The class range was obtained from the five-point Likert Scale adopted in obtaining the data.

Table 1: Class Range of Average Index	
Mean Range	Likert Scale
1 ≤ Average Index < 1.49	None Performance
1.50 ≤ Average Index < 2.49	Low Performance
2.50 ≤ Average Index < 3.49	Moderate Performance
3.50 ≤ Average Index < 4.49	High Performance
4.50 ≤ Average Index < 5.0 Index	Very High Performance
Source: Morenikeji (2006)	

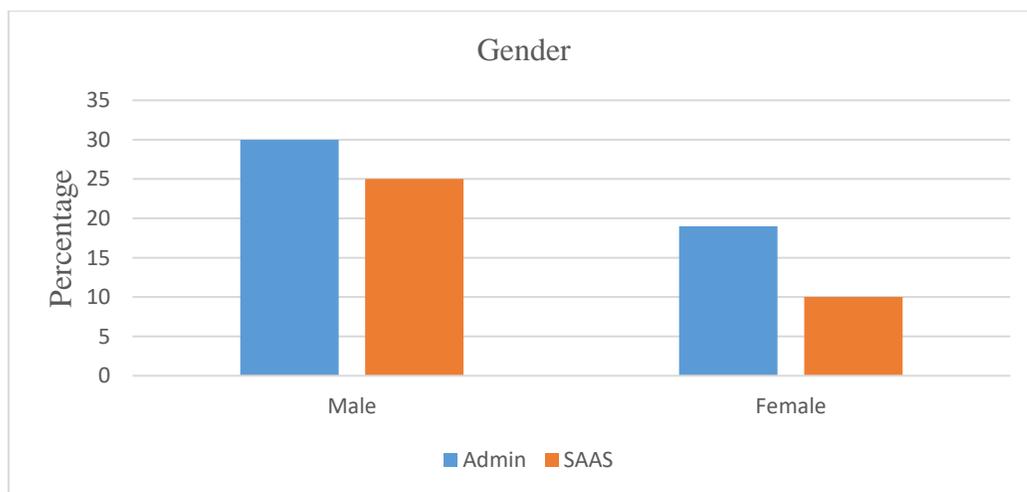


Figure 2: Type of gender occupying the offices

Source: Field survey 2018

Figure 2 shows the opinion drive of different respondents on gender. 30 and 25 males responded to the questionnaire given out for administrative block and SAAS building, these figures represent 61.22% and 38.76% respectively, whereas 71.43% and 28.57% represent the percentage of the female gender that respond to the questionnaire given out for the research. These mixtures are achieved since both sexes work in these two buildings, therefore they are in better position to give better result for the research.

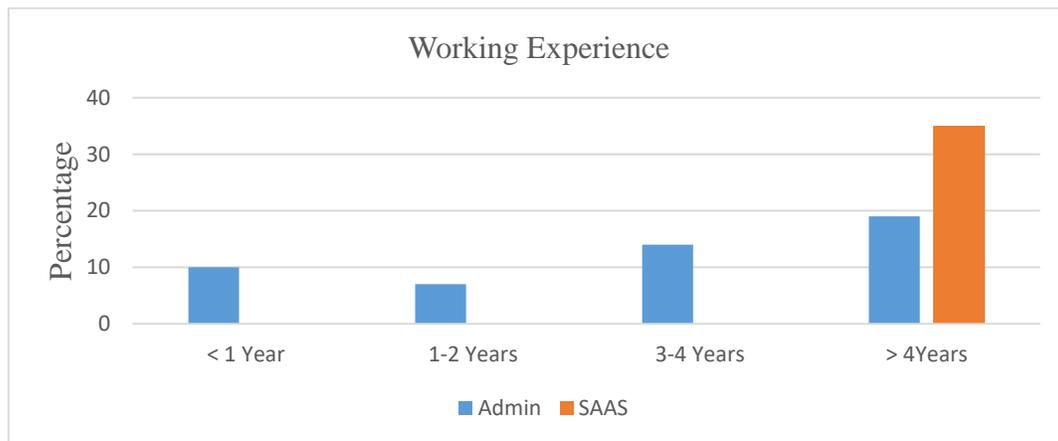


Figure 3: Number of years the staff spent in the polytechnic

Source: Field survey 2018

Figure 3 shows that in both admin and SAAS building the respondents have spent a considerable number of years working in the building. Less than 30.61% have their services in the polytechnic less than 4 years and 69.39% in the two buildings have their services more than 4 years in the polytechnic making it reliable since the BPE is to be done after 5 years to determine the comfort ability of the buildings.

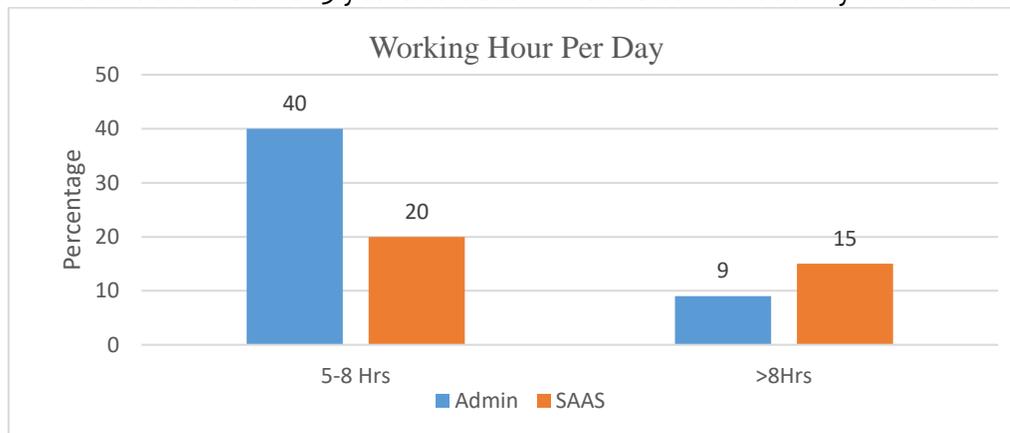


Figure 4: Number of hours spent in the office

Source: Field survey 2018

Figure 4 represent the number of working hours most workers spend in their offices on a daily bases to carry out their functions. In administrative block 45 people spend between 5 - 8 hours in a day while 9 people spend more 8 hours in a day on a daily basis. Unlike admin in SAAS building, only 20 people spend their working hour between 5 - 8 hours in a day while 15 people spender more than 8 hours in a day in their offices.

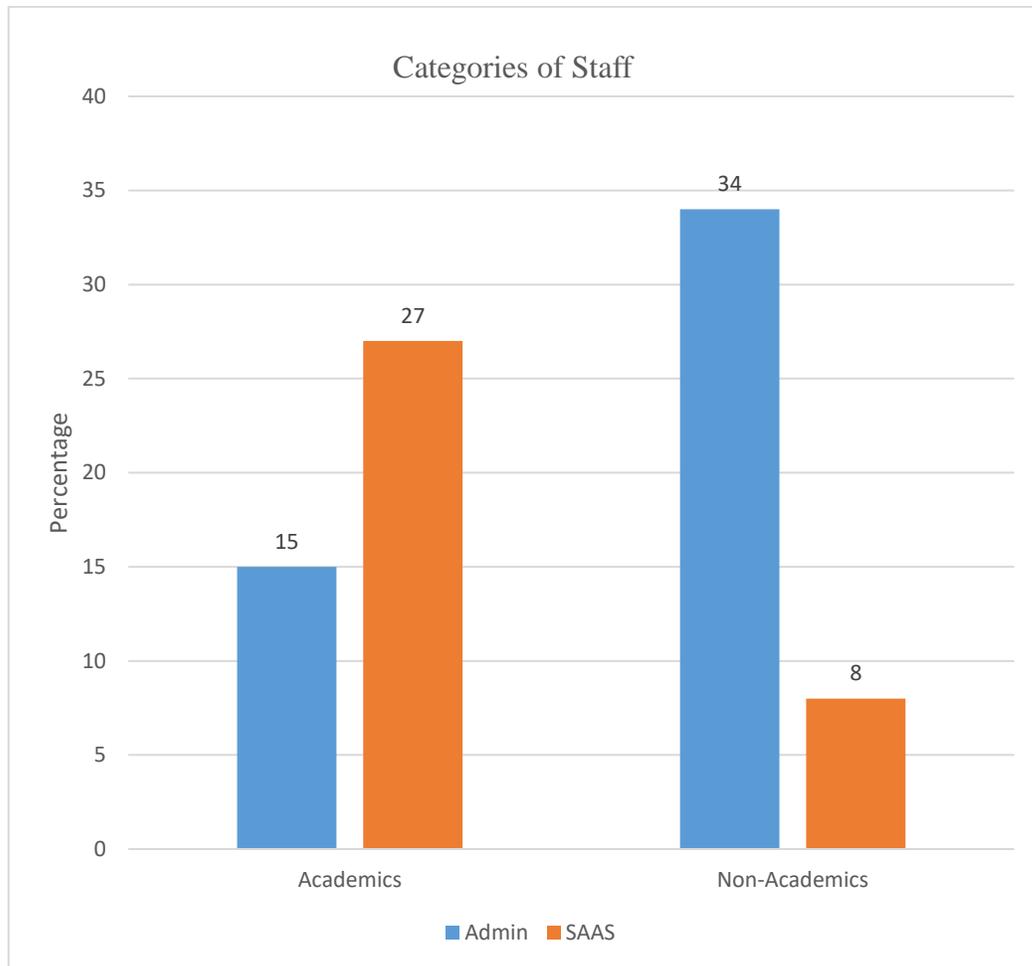


Figure 5: Categories of staff occupying the offices
Source: Field survey 2018

Figure 5 shows academic and non-academic staff responded to the questionnaire distributed, in administrative block 15 academic staff responded while 34 non-academic responded respectively. In a similar manner 27 academic staff and 8 non-academic staff responded to questionnaire distributed to SAAS building.

Table 2: Internal Performance Evaluation of Administrative Block and SAAS Building

S. No	Performance Evaluation	Disagree		Disagree		Undecided		Agree		Strongly Agree		Mean	
		Admin	SAAS	Admin	SAAS	Admin	SAAS	Admin	SAAS	Admin	SAAS	Admin	SAAS
1	Internal lighting and acoustics are favourable for work.	17	5	12	17	0	3	20	10	0	0	2.47	2.514
2	The temperature of the office adds to the comfort during hot and cold season.	0	3	9	13	6	12	30	7	4	0	3.59	2.657
3	Are the offices equipped with an air conditioner cooling system?	0	33	22	0	0	0	25	2	2	0	3.14	1.171
4	Does the air conditioner cooling system in the office perform satisfactorily?	10	32	16	3	1	0	20	0	2	0	2.75	1.086
5	The ventilation of the office is very conducive for work execution	0	12	17	5	8	4	24	9	0	5	3.14	2.971
6	There are adequate toilet facilities in the office.	6	35	35	0	0	0	2	0	6	0	2.32	1.000
7	There are basic essential services like water and electricity in the office.	2	27	33	8	3	0	9	0	2	0	2.51	1.223
8	Do the internet facilities and good information dissemination system in office	7	32	18	2	0	0	22	1	2	0	2.87	1.143

9	Colour reflection from wall paintings in the office causes discomfort.	10	35	39	0	0	0	0	0	0	0	1.79 6	1.00 0
10	Any experiencing in building related illness (SBS)	42	0	7	14	0	5	0	13	0	3	1.143	3.14 3
11	The office building is conducive in terms of its finishing's.	0	10	32	15	10	9	7	1	0	0	2.49 0	2.02 9
12	The furnishings in the office are suitable for an office set-up.	12	25	23	3	0	0	10	7	4	0	2.40 8	1.68 6
13	The ceiling units in the office are in a perfect condition	0	2	12	9	0	14	31	4	6	6	3.63 2	3.08 6
14	There are good filing and storage system in the office for storage of personal files/office documents	11	26	18	5	1	0	19	4	0	0	2.571	1.48 6
15	Office setting is confidential for conversation without interruption.	0	15	27	14	12	4	10	2	0	0	2.65 3	1.80 0
16	The work environment is very confidential for greater concentration on assigned tasks.	18	8	9	16	2	9	20	2	0	0	2.49 0	2.14 3
17	Satisfied with the overall cleanliness in work environment.	19	0	15	19	0	10	10	6	5	0	2.32 7	2.62 9

18	Satisfied with the overall orderliness and safety in work environment.	0	5	29	20	5	5	15	5	0	0	2.714	2.286
19	The security level in the complex building makes one feel safe at work.	8	35	12	0	22	0	5	0	2	0	2.612	1.000
20	The staircases are user friendly.	0	0	8	3	5	17	19	0	17	15	3.920	3.771

Source: Field Source 2018

Table 2 shows staircase been user friendly top the ranked for both the admin and SAAS buildings with a mean score of 3.920 and 3.771 respectively. This signifies that people move in the building up and down easily without stress as a result of convenience in stair. High performance function of the staircase means a lot to evaluation of the building. 3.632 and 3.086 are mean score for both admin and SAAS buildings performing moderately in terms of condition of ceiling units in the offices. The nature of the building and mode of construction might have necessitated the performance of these ceiling units since some both structures are one story building. Any experience in building related illness like sick building syndrome (SBS) is ranked moderate in SAAS with a mean score of 3.143 while 3.592 and was ranked high in admin building for the temperature of the office adds to the comfort during hot and cold season. The ventilation of the offices is conducive for work execution is ranked 4th position for both admin and SAAS building with the mean score of 3.143 and 2.971 respectively. This shows that staff spends more time in their office beyond the closing hour for the day. Adequacy of the toilet facilities in the office, overall cleanliness in the work place, color reflection from wall painting in the office causes discomfort and experience in building related illness are the list ranked among the performance evaluation variables that are considered in the study with mean scores of 2.327, 1.796 and 1.143 respectively for administrative. Use of internet facilities and good information dissemination system in office, performance function of the air conditioning cooling system to the optimal satisfactory and color reflection from wall painting in the office causes discomfort as well as security level in the complex building makes a feel safe at the

work place were ranked least with the mean scores of 1.143, 1.086 and 1.000 respectively for SAAS building.

Table 3: External Performance Evaluation of Administrative Block and SAAS Building

S. No	Performance Evaluation	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree		Mean	
		Admin	SAAS	Admin	SAAS	Admin	SAAS	Admin	SAAS	Admin	SAAS	Admin	SAAS
1	Location of the office complex is convenient for the early attendance to work.	0	0	0	6	0	4	23	6	26	19	4.530	4.086
2	Location of the office complex is accessible to commercial transport means.	0	0	0	3	5	0	40	20	4	12	3.980	4.171
3	The office workspace has good space and transparency for work execution.	10	8	21	5	2	9	15	11	1	2	2.510	2.829
4	There are parking lots for vehicles in the office.	0	0	0	0	12	19	22	14	15	2	4.061	3.514
5	The parking lot in the office is large enough to accommodate all staff's vehicles as well as visitors.	13	7	19	8	17	11	0	9	0	0	2.082	2.629
6	The security levels outside the building premises make one feel at ease when vehicle are parked at the parking lot.	5	10	17	5	9	20	15	0	3	0	2.876	2.286
7	The premises of the office complex are always kept clean and safe.	0	8	2	18	15	2	32	7	0	0	3.612	2.229

Source: Field Survey 2018

Table 3 shows location of the office complex is convenient for the early attendance to work in administrative building having a mean score of 4.530 and was ranked very high in performance. This may be the reason administrative staff of the polytechnic report to the office early to carry out their duties diligently, whereas in the case of SAAS complex location of the office complex is accessible to commercial transport and location of the office complex is convenient for the early attendance to work were ranked high among other performance variables with mean score of 4.171 and 4.086 respectively. The administrative block location of the office complex accessibility to commercial transport means was ranked high with the mean score of 3.980. These have been made possible for people to resume to the duty post early because of easy access to the office. The position of parking space in the office is large enough to accommodate all staff's vehicle as well as visitors was ranked low in performance with a mean score of 2.082 for the administrative block. These means a lot of effort is required to give attention to the parking space in the administrative block to protect people from parking along the road leading to the office. The premises of the office complex are always kept clean and safe for SAAS building was ranked lowest performance with mean score of 2.229. These indicate that even though cleaning is done within the premises of the building more effort is still required to keep the environment green and tidy for health and security of the users of the building.

CONCLUSION

Conclusively, it has been established therefore, that there is poor performance of BPE during the study because of indicators in both buildings studied. This therefore goes to establish that the complexes are physically not sound in terms of the structure envelope, functional viability in terms of users' satisfaction and yielding in terms of workers' productivity. However, improvisation and complaints are not necessarily the result of bad design. They could be the result of an outdated concept of design and/or lack of proper building facility maintenances, because, it has been realized that post occupancy stage is a dynamic model, and changes overtime can cause different effects.

From this study, it can be concluded that BPE provides significant impact on creating change in terms of improving building environment in two ways. Firstly, by providing lessons and feedback for the owner or those involved in the environment improvement works. They can lead towards enhanced quality of

indoor environment by sensitivity to changing needs of occupants. Secondly, by empowering end-users as post-occupancy evaluation that provides benchmark and a pool of analysis to show how the end product that is, the building design and its environment management, meets the needs of its client and users. By effective implementation of BPE, it enables the relevant stakeholder to shorten the learning time about the positive and negative environment changes. Therefore, the paper recommended the followings:

- v. General maintenance works be carried out on both buildings and a maintenance culture strictly adhered to afterwards.
- vi. The management should improve maintenance and management aspect of the buildings in terms of adequate services and facilities provided to serve the occupants. The services and facilities such as adequate water supply, electricity, regular waste disposal management, environmental cleanliness, adequate furnishings, adequate Heating, Ventilation and Air Conditioning (HVAC) system, Information technology system and so on. This will improve comfort and resultant improved productivity of occupants.
- vii. Adequate toilet facilities should be provided in the buildings and these should be kept functional and clean to avoid odour and accumulation of health hazardous gases.
- viii. All construction players should prioritize application of BPE as strategic level decision making and emphasized as continuous activity in environmental evaluation towards sustainability of building assets.

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