BINARY LOGISTIC REGRESSION ON STAFF SATISFACTION WITH ALLOTTED OFFICES IN FEDERAL POLYTECHNIC, BAUCHI

LAWAL ADEMOLA S[1] LEKA CAPHAS[2] AND IBRAHIM ABDULHAKEEM[3]

[1&3]*Mathematics and Statistics Dept., Federal Polytechnic Bauchi* [2]*Office Technology and Management Dept., Federal Polytechnic Bauchi*

ABSTRACTS:

The main purpose of this study is to investigate the relationship between befitting offices and staff satisfaction in order to make recommendations which will help improve staffs' performance in Federal Polytechnic Bauchi, Bauchi State. An office is a place where professional duties and administrative work are carried out in the organization's building. A survey questionnaire of 29 questions was administered to a sample of 120 academic staffs selected by a stratified random sampling technique of which a total of 86 questionnaires were returned (response rate of 71.67%). The descriptive analysis was used to determine the proportion of staffs with befitting offices while binary logistic regression technique was used to examine the likelihood of an academic staff satisfaction (dependent variable) against his/her perception about the office elements (independent variables) like furniture, noise, temperature, lightings, equipment and ventilation. Findings from the study showed that 50% of staff of FPTB feel satisfied with their office while others are not satisfied, it was also discovered in the interpretation which implies that furniture, noise, equipment and ventilation have a significant impact on FPTB staffs' satisfaction, while temperature and lighting has no significant effect on the staffs. The study recommended that more attention should be provided on the office ventilation and equipment so as to have a sustainable and conducive atmosphere and well-furnished offices as recommended by NBTE. Also, lower noise level should be

sought for most especially in School of General Studies and School of Business as it has significant effect on Academic Staff satisfaction.

INTRODUCTION

In recent years, employees' comfort on the job, determined by workplace conditions and environment, has been recognized as an important factor for measuring productivity. While it is easy to envision that changes to the physical comfort of the worker may result in measurable changes in performance, it is also well known that humans are extremely adaptable, and will readily accommodate over time to a wide variety of conditions. As more and more computers are being installed in workplaces, an increasing number of businesses have been adopting ergonomic designs for offices and plant installations. Ergonomics, also called biomechanics, has become popular because of demand from workers for more human comfort.

The impact of office setting has been noted by many studies as being one of the key elements related to equipping employees (staff) in their place of work to help produce a good performance. The quality of the employee's workplace environment has a major impact on the level of employee's motivation and subsequent performance. How well they engage with their organization, especially with their immediate environment, influences to a great extent their error rate, level of innovation and collaboration with other employees, absenteeism and, ultimately, how long they stay in the job (Al-Anzi, 2009).

Office environment can be described in terms of physical and behavioral components. These components can further be divided in the form of independent variables. An organization's physical environment and its design and layout can affect employee behavior in the workplace. Although convenient workplace conditions are requirements for improving productivity and quality of outcomes, working conditions in many organizations may present with lack of safety, health and comfort issues such as improper lightening and ventilation, excessive noise and emergency excess (Clements-Croome, et al 2010).

Business Dictionary.com (2012), defines workplace environment as a location where a task is completed. When pertaining to a place of employment, the work

environment involves the physical geographical location as well as the immediate surroundings of the workplace, such as a construction site or office building. Typically, the environment workplace involves other factors relating to the place of employment, such as the quality of the air, noise level, and additional perks and benefits of employment such as free child care or unlimited coffee, or adequate parking.

Physical factors in the workplace such as poor layout or overcrowding can lead to common types of accident such as tripping or striking against objects (Chandraskar, 2011). Among the factors affecting workers performance such as office building space have been strongly associated with workers performance in private sector office employees. Environmental factors including office layout, level of interaction and the comfort level of office have had a significant effect on workers performance. Comfort level factors such as temperature, lighting, presence of privacy and ventilation can have a direct impact on employees' health; for example, very high temperatures can lead to heat stress and heat exhaustion. A study conducted in Malaysia reports that the brightness of office light effects alertness, concentration, and task performance (Chandrasekar, 2011).

Over the years, many organizations have been trying new designs and techniques to construct office buildings, which can increase productivity, and attract more employees. Many authors have noted that the physical layout of the workspace, along with efficient management processes, is playing a major role in boosting employees' productivity and improving organizational performance (Chandrasekar, 2011). In the modern era, organizations are facing several challenges due to the dynamic nature of the environment. In order to increase efficiency, effectiveness, productivity and job commitment of staffs, the organization management must satisfy the needs of its employees by providing good working conditions. Hence, it is essential for an organization to motivate their employees to work hard for achieving the organizational goals and objectives (Abdul Razaqi & Raheela Maulabakhsha, 2015).

Sonnentag (2002) defined the productivity as, "productivity is that which people can produce with the least effort". He also defined subjective performance measure as an indicator used to assess individuals' aggregated perceptions, attitudes or assessments toward an organization's product or service. Subjective productivity data is usually collected using survey questionnaires. Subjective

data can also be descriptive or qualitative collected by interviews. (Clements-Croome and Kaluarachchi 2000) Subjective productivity data is gathered from employees, supervisors, clients, customers and suppliers.

Some literatures describe the factors that influence the performance of employees, scholars like Haynes (2008), explains that the office environment has a great impact on office productivity of staffs. In all of the work patterns, it was found that interaction was perceived to be the component to have the most positive effect on productivity whether negative or positive, and distraction was discovered to have the most negative. As people are the most valuable resource of an organization, management of people makes a difference to company performance. The befitting office environment factors can be conceptualized as the following elements. The elements such as office furniture, noise level, temperature, lighting and ventilation are essentially independent variables impacting on staff satisfaction with office setting, the dependent variable.

The main purpose of this study is to investigate the relationship between befitting offices and staff satisfactionusing logistic regression approach. The following hypothesis is formulated.

Hypothesis
1. **H_0**: There is no relationship between a befitting office environment and satisfaction level of academic staffs in Federal Polytechnic, Bauchi
2. **H_1**: There is a relationship between befitting office environment and satisfaction of staffs in Federal Polytechnic, Bauchi.

METHODOLOGY
Primary data was collected through a structured questionnaire to collect information about the office design and job satisfaction. The Questionnaire consists of 29 questions; four questions on the demographic data, three questions on each of the six variables and seven questions were on staff's satisfaction with office environment, based on the technique of subjective satisfaction measurement. Subjective satisfaction data was gathered from the academic staffs both junior and senior lecturers. Questions were measured by the two-point Likert Scale ranging from 1 (Yes) and 0 (No). The questions in the questionnaire for the subjective satisfaction measurement were in percentages. The target population of this study was all academic staffs of

Federal Polytechnic, Bauchi. As at the survey, the institution had 489 academic staff of which a sample size of 120 staff were selected by means of stratified random sampling so as to have representative sample. Out of 34 departments, 12 departments were considered of which 2 two departments were selected randomly from each of the six (6) school (faculty) in FPTB. The scores of the responses on each of the 29 questions were subjected to test of reliability to assessing the level of internal consistence of the data.

BINARY LOGISTIC REGRESSION

Logistic regression is a flexible method for modelling and testing the relationships between one or more quantitative and/or categorical explanatory variables and one binary (i.e., two levels) categorical outcomes. Similar method was adopted by Ajao, Obafemi and Lawal (2011). The two levels of the outcome can represent anything, but generically we label one outcome "success" and the other "failure". Also, conventionally, we use code 1 to represent success and code 0 to represent failure. Then we can look at logistic regression as modelling the success probability as a function of the explanatory variables. Also, for any group of subjects, the 0/1 coding makes it true that the mean of Y represents the observed fraction of successes for that group.

Logistic regression resembles ordinary linear regression in many ways. There is usually an intercept parameter (β_0) plus one parameter for each explanatory variable $(\beta_1 through \beta_k)$, and these are used in the linear combination form: $(\beta_0 + \beta_{1x_1} + \cdots + \beta_k x_k)$.

In logistic regression, a complex formula is required to convert back and forth from the logistic equation to the OLS-type equation. The logistic formulas are stated in terms of the probability that $Y = 1$, which is referred to as p. The probability that Y is 0 is $1 - p$

$$ln\left(\frac{p}{1-p}\right) = \alpha + \beta_1 x_1 + \beta_2 x_2$$

P can be computed from the regression equation also. So, if we know the regression equation, we could, theoretically, calculate the expected probability that $Y = 1$ for a given value of X.

$$p = \frac{exp(\beta_0 + \beta_{1x_1})}{1 + exp(\beta_0 + \beta_{1x_1})} = \frac{e^{\beta_0 + \beta_{1x_1}}}{1 + e^{\beta_0 + \beta_{1x_1}}}$$

Binary logistic regression model was used to test the joint null hypothesis for estimating the relationship between overall level of academic staff office satisfaction and various variables which seem to influence office environment satisfaction. The logistic regression model that was estimated to test the joint null hypothesis is given below;

$(Y) = \log(p/1-p) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \varepsilon t,$

Where:

Y = Dependent variable (1=> if staff is satisfied with his office, 0 = >If otherwise)

P = Probability (Y= Outcomes of interest)

A = Constant

B_s = regression coefficients for individual predictor variables

X_1 = Furniture

X_2 = Noise

X_3 = Temperature

X_4 = Lighting

X_5 = Equipment

X_6 = ventilation

Et = Error term assumed to have a mean of zero. (D. Fulus, et al.)

DATA ANALYSIS

Collected data was coded into spread sheet and the software used for analysis is Statistical Package for Social Sciences (SPSS). Six indicators of office design such as furniture, noise, temperature, lighting and ventilation which was used to determine the level of satisfaction are considered for study.

OVERALL STAFFS' SATISFACTION WITH OFFICE

This section gives the answer to the first research question of this research, which asked for the proportion of staffs who are satisfied with their respective offices

Are you satisfied with your present Office settings and Design?	Frequency	Percentage
No	43	50.0

Yes	43	50.0
Total	**86**	**100.0**

Table 1: Overall Staffs' Satisfaction with Office

Table 1 indicates 50% of the respondents reported that they are satisfied with their office while the remaining 50% however expressed the opinion that they were not satisfied with their office settings and design.

Relationship between Staff Satisfaction and Office Predictor Variables

A six predictor's logistic model was fitted to the data to examine the log likelihood of a FPTB academic staffs to be satisfied with their office against some office settings elements variables of interest. The results of the binary logistic estimated models will be presented in the following tables below.

Dependent Variable Encoding	
Original Value	**Internal Value**
No	0
YES	1

Table 2: Dependent Variable Encoding

The coding of the responses was done by representing YES with 1 as the internal value and NO responses to be 0

OMNIBUS TESTS OF MODEL COEFFICIENTS

	Chi-square	Df	Sig.
Step	30.257	6	.000
Block	30.257	6	.000
Model	30.257	6	.000

Table 3

The table 3 shows the omnibus test of model coefficients which was used to check that the new model (with explanatory variables included) is an improvement over the baseline model. A p-value (sig) of less than 0.05 (i.e. $p<0.05$) for block means that the new model is a significant improvement of the baseline model. In our case model chi square has 7 degrees of freedom, a value

of 30.257 and probability of 0.000 (i.e. p<0.05). Thus, the indication is that the model containing only the constant has a poor fit, indicating that the predictors do have a great significant effect and create essentially a different model, so our new model is better.

MODEL SUMMARY

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	87.566[a]	.300	.399

Table 4:

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

The table 4 provides the -2LL and pseudo-R^2 values for the full model. The -2LL value for this model (87.566) is what compares to the -2LL for the previous null model in the 'omnibus test of model coefficients' (i.e. 30.257) which told us there was significant decrease in the -2LL, i.e. that our new model (with explanatory variables) is significantly better fit than the null model. The R^2 value tells us approximately how much variation in the outcome is explained by the model. **Cox and Snell R^2** here is indicating that 30.0% of the variation in the dependent variables is explained by the logistic model, and the **Nagelkerke** R^2 that does range from 0 to 1 is more reliable measure of the relationship and it is normally higher than Cox and Snell's measure, in our case it is 0.399 indicating a moderately weak relationship of 39.9% between the predictor and the prediction.

HOSMER AND LEMESHOW TEST

Chi-square	Df	Sig.
6.673	7	.464

Table 5:

One inferential test and two descriptive measures were used to evaluate the fitness of the logistic model against actual outcomes. The inferential goodness-of-fit test is the Hosmer and Lemeshow (H-L) statistic that yielded a chi-square

value of 6.673 which was not statistically significant *(p > 0.05)*, as shown in table 5, this suggests that the model fit the data well.

CLASSIFICATION TABLE

Observed		Predicted		
		Are you satisfied with your present office Settings & Design?		Percentage Correct
		No	Yes	
Are you satisfied with your present Office settings & Design?	No	32	11	74.4
	YES	12	30	71.4
Overall Percentage				**72.9**

Table 6:

Table 6 is based on the model that includes our explanatory variables. The columns are the two predicted values of the dependent variables, while the rows are the two observed (actual) values of the dependent. In a perfect model all cases will be on the diagonal and the overall percent correct will be 100%. In this study 74.4% were correctly classified as not satisfied group (No) and 71.4% as satisfied group (yes). Overall of 72.9% were correctly classified.

Table 6: LOGISTIC REGRESSION COEFFICIENT OF THE PREDICTOR VARIABLES

	B	S.E.	Wald	Df	Sig.	Exp(B)
Constant	-.024	.217	.012	1	.914	.977

Table 7:   **Variables in the Equation**

Office Elements	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Furniture	2.509	1.263	3.949	1	.047	12.292	1.035	145.97
Noise	2.745	1.109	6.121	1	.013	15.557	1.769	136.83
Temperature	-.951	1.024	.862	1	.353	.386	.052	2.88
Light	-3.528	1.399	6.360	1	.012	.029	.002	.456

Equipment	2.970	.981	9.164	1	.002	19.483	2.849	133.24
Ventilation	.066	.756	.008	1	.930	1.068	.243	4.703
Constant	-1.967	1.495	1.730	1	.188	.140		

According to table 7, the model regression coefficients, ($\beta_1 = 2.509$) the log of the odds of FPTB staffs to be satisfied with their office was positively related to their furniture. However, the log likelihood given as exponential regression coefficient (Exp β_1) i.e. the odd ratio was 12.292, meaning that some staffs were 12 times more likely to be satisfied with their office than others who says they are not satisfied with office in terms of furniture. This log likelihood was statistically significant at 95% level of confidence ($p < 0.05$) meaning that furniture of academic was a good predictor of office satisfaction at FPTB.

Table 7 also shows that the model regression coefficients, ($\beta_2 = 2.745$) the log of the odds of FPTB staffs to be satisfied with their office was positively related to their environment's noise, the log likelihood given as (Expβ_2) i.e. the odd ratio was 15.557, meaning that some staffs were 16 times more likely to be satisfied with their office than others who says they are not satisfied with office in terms of noise. This log likelihood was statistically significant at 95% level of confidence ($p < 0.05$) meaning that noise has a great significant on academic staffs' satisfaction with office setting at FPTB.

Table 7 also show the model coefficients, ($\beta_3 = -.951$) the log of the odds of FPTB staffs to be satisfied with their office was negatively related to their office temperature, the log likelihood given as (Expβ_3) i.e. the odd ratio was 0.386 meaning that some staff were 0.4 times more likely not to be satisfied with their office than others who say they are satisfied with office in terms of temperature. This log likelihood was not statistically significant at 95% level of confidence ($p > 0.05$) meaning that temperature of academic staff office was not a good predictor of staffs' satisfaction in terms of office setting at FPTB.

The table 7 also shows that the model regression coefficients, ($\beta_4 = -3.528$) the log of the odds of FPTB staffs to be satisfied with their office was negatively related to office lighting, the log likelihood given as (Expβ_4) i.e. the odd ratio was 0.029, meaning that some staffs were 0.03 times more likely not to be satisfied with their office than others who says they are satisfied with office in terms of office lighting. This log likelihood was statistically significant at 95% level of confidence ($p < 0.05$) meaning that noise was not a good predictor of staff's office satisfaction with office setting at FPTB.

According to table 7, the model regression coefficients, ($\beta_5 = 2.970$) the log of the odds of FPTB staffs to be satisfied with their office was positively related to their equipment. However, the log likelihood given as exponential regression

coefficient (Exp β_5) i.e. the odd ratio was 19.483, meaning that some staffs were 19.5 times more likely to be satisfied with their office than others who says they are not satisfied with office in terms of equipment. This log likelihood was statistically significant at 95% level of confidence ($p < 0.05$) meaning that equipment of academic was a good predictor of office satisfaction at FPTB.

Table 7 also show the model coefficients, ($\beta_6 = 0.066$) the log of the odds of FPTB staffs to be satisfied with their office was positively related to their office ventilation, the log likelihood given as (Exp β_6) i.e. the odd ratio was 1.068 meaning that some staff were just one time more likely to be satisfied with their office than the others who sat they are not satisfied with office in terms of ventilation. This log likelihood was statistically significant at 95% level of confidence ($p > 0.05$) meaning that ventilation of academic staff office may be a good predictor of staffs' satisfaction in terms of office setting at FPTB.

In a nutshell, it was discovered in the interpretation that furniture, noise, equipment and ventilation have a significant impact on FPTB staffs' satisfaction, while temperature and lighting has no significant effect on the staffs. Majority of the staffs were satisfied with their furniture, lightings, and ventilations but not satisfied with their office temperature, noise level and equipment, majority specified they do not have any office equipment most especially computer systems.

CONCLUSION

This study has assessed the satisfaction with office setting on the productivities of employees operating in FPTB. From the findings of the study, which identifies substantial office design lapses such as inadequate office illumination, use of old furniture, appreciable noise levels it is obvious that FPTB is yet to leverage on its office setting as a means of motivating and enhancing the performance of its academic staffs.

RECOMMENDATIONS

In view of the results and conclusion of the study, the following recommendations are made for consideration by FPTB as a means of utilizing a befitting office to motivate and enhance the performance of its academic staffs.

1. According to this research, it was found that there is a high (significant) relationship between the office setting elements and the staffs' satisfaction. Under the elements of office design furniture, noise, lightning, equipment, lighting and ventilation, it was found that furniture

and noise have a high impact on the staffs' satisfaction and that should be considered accordingly.

2. The study also recommends that more attention should be provided on the office ventilation and equipment so as to have a sustainable and conducive atmosphere and well-furnished offices as recommended by NBTE. Also, lower noise level should be sought for most especially in School of General Studies and School of Business as it has significant effect on Academic Staff satisfaction.

REFERENCE

Abdul R., & Raheela M. (2015). Motivation and Job Performance of Academic Staff. *International Journal of Business and Manegement, 7*(14).

Ajao, I.O., Obafemi, O.S and Lawal, A.S. (2011). 'Influence of some Risk Factors on Maternal Mode of Delivery: Binary Logistic Regression Approach', *International Journal of Physical Science, Volume 6, Number 1, pg 10*

Al-Anzi, N. M. 2009. *Workplace Environment and its Impact on Employee Performance.* MBA Thesis*, Open University of Malaysia*, *Bahrain*.

Beautyman, M. 2006. Office Design Effects, Innovation, and Creativity. Available:http://www.interiordesign.net/idnewsarticle/CA6356188.html (Accessed 20 February 2015).

Bnet Business Dictionary 2008

Chandrasekar, K. (2011). Workplace Environment and its Impact on Organizational Performance in Public Sector Organizations. *InternationalJournalof Enterprise Computing and Business Systems, 1(1): 1-19.*

Clements-Croome, D. and Kaluarachchi, Y. (2010).*An assessment of the Influence   of   the Indoor Environment on the Productivity of Occupants in Offices.*

Field, A. (2005) *Discovering Statistics using SPSS for Windows: Advanced Techniques for the Beginner*, London: Sage. Chapter 6.

Haynes. B. P. (2008). An Evaluation of the Impact of the Office Environment on Productivity Facilitie*s, Journal of Business, Economics and Finance,* 26(6): 178-195.

Hughes, J. 2007. *Office Design is Pivotal to Employee Productivity*. San Diego Daily Transcript, July 2.

Leblebici, D. (2012). Impact of workplace Quality on Employee's Productivity: Case Study of a Bank in Turkey. *Journal of Business, Economics and Finance,*

McCullagh P and Nelder J.A, (1989) *Generalized Linear Models (Second Edition).*Chapman and Hall

Sonnentag. S. 2002: *Psychological Management of Individual Performance*, Chichester: John Wiley.