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ASSESSMENT OF THE HEALTHY INDOOR ENVIRONMENTAL QUALITY PRACTICES ADOPTED IN THREE STAR HOTELS IN ABUJA

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Abstract

The study investigated the healthy indoor environmental quality practices adopted in three star hotels in Abuja. Indoor environmental quality is one of the key dimension of green building practices. The population of the study was 114 (89 facility managers and 25 registered builders). Two research questions were raised and two hypothesis tested at .05 level of significance guided the study. The instrument for data collection was a 20-items Questionnaire on Healthy Indoor Environmental Quality Practices in Three-Star Hotels (QHIEQPTSH) developed by the researcher. The questionnaire was validated by three building technology experts in the Department of Industrial and Technology Education, Federal University of Technology Minna, Niger State. A pilot test of the instrument was carried out in Lafia, Nasarawa State. The Cronbach alpha coefficient Method was used to determine the internal consistency of the instrument and 0.80 was obtained as the overall reliability coefficient of the instrument. Data collected was analyzed and Mean and Standard Deviations were used to answer the research questions while Z-test analysis was used to test the hypothesis at .05 level of significance. Findings revealed among other things that 10 healthy indoor environmental quality practices are presently adopted in three star hotels in Abuja. It was also found that there is no significant difference between the mean ratings of facility managers and registered builders on the healthy indoor environmental quality practices adopted in three star hotels in Abuja. Based on these findings therefore, it was recommended among others that healthy indoor environmental quality practices should be adopted in other categories of hotels in Abuja in order to not only ensure the comfort and wellbeing of hotel customers, but to also preserve the environment.

Keywords: *Healthy Indoor Environmental Quality, Greenhouse Gas Emissions, Climate Change, Hotels and Sustainable Development.*

Introduction

Greenhouse gas (GHG) emissions are seen as the primary culprits behind the menacing phenomena of global warming and climate change. Green practices such as healthy

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indoor environmental quality, have been proposed by the United Nations Development Programme (UNDP, 2014) as potential solutions to combat the menace of climate change. Green practices which are also referred to as green building practices has been defined by Yudelson (2014) as a comprehensive term for those strategies that are aimed achieving energy efficiency, water efficiency, material efficiency and a healthy indoor environmental quality in buildings. Indoor environmental quality (IEQ) simply means the quality of a buildings environment in relation to the health and safety of those who occupy that environment. IEQ is a very important dimension of green building practices due to its strong links with energy efficiency. Thus, many energy efficiency measures for buildings also influence comfort conditions and indoor air quality. Thermal insulation of the building envelope for example improves thermal comfort, while the provision of windows for increased ventilation and daylighting improves indoor air quality and visual comfort. Thus, a healthy IEQ in the building envelope not only improves the health and comfort of the building occupants, but it also reduces overall energy consumption in the building.

According to Vardoulakis et al., (2015) and Yousef et al., (2016), poor IEQ leads to short and long term impact on the resident's performance, productivity, and physical and mental health development. Occupants of buildings with poor IEQ often develop what is known as sick building syndrome. Symptoms of sick building syndrome include watery eyes, headaches, fatigue and nausea. Chemicals emitted from building materials can be a potential source of health problems if they are not properly addressed. There is therefore a need to avoid the use of toxic materials like asbestos in buildings in order to improve IEQ. Green buildings encourage the use of products and materials that reduce or eliminate these sources of indoor pollution. These include a wide range of products such as paints with low or no volatile organic compounds, solvent free adhesives and water based wood finishes that not only eliminate many of the suspected and known carcinogens, but often perform better than traditional products. According to Yousef et al (2016), IEQ is comprised of a combination and interaction among four main factors that affect health and comfort. They are:

1. Thermal comfort: This refers to the operative temperature that people experience. This includes energy transfer that a person experiences via convection (air temperature), conduction (temperature or surfaces they physically are in contact with), and radiation (radiative energy transfer from surrounding surfaces). Thus, thermal comfort is concerned with variables such as air temperature and relative humidity.
2. Visual comfort: This refers to all aspects pertaining to what and how occupants see, such as the colour and strength of lighting, the colour and design of walls,

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as well as views out of the building. Variables factors affecting visual comfort include light intensity and color index.

3. **Acoustic Comfort:** Acoustic comfort is concerned with all aspects pertaining to what occupants have to hear, including ambient noise from outside the building, and noise levels inside the building from machines, people, the ventilation system or any other source.
4. **Indoor air quality:** As the name suggests, this is the standard of the air we breathe inside buildings. Indoor air quality is affected by factors such as the concentration of pollutants in the air (such as radon, carbon dioxide, water vapour, ozone, etc.) as well as the bacterial load, and presence of pathogens or allergens.

Green building practices such as healthy indoor environmental quality have gained popularity in other parts of the world, especially in developed countries due to the dual realization that greenhouse gas (GHG) emissions remain the primary drivers of global warming and climate change and also that buildings, are significant contributors to GHG emissions (Cheng, 2014). The United Nations Environment Programme (UNEP, 2014) also reported that, globally, buildings account for up to 40% of total energy consumption and 30% of GHG emissions. Similarly, the IEA (2016) singled out the building sector as being responsible for more than 40 percent of the world's total primary energy consumption and for 24 percent of global Carbon dioxide (CO₂) emissions. CO₂ is one of the greenhouse gases which go high up in the atmosphere and trap heat, causing the greenhouse effect and consequently, global warming and climate change.

As a result of the menace of climate change which affects both developed and developing countries like Nigeria, the countries of the world met in Brazil in the year 2010 to find a way out. This meeting resulted in the adoption of the green initiative, intended to save the planet from human destruction. One of the cardinal principles of the green initiative is sustainable development for all. To achieve this, adopting green practices such as a healthy IEQ in buildings has become imperative. This is because according to Yudelson (2014), a healthy IEQ in buildings helps to lower GHG emissions which in turn helps to mitigate the effects of global warming and climate change. Bello (2015), stated that combating climate change in the 21st century has become highly imperative because humanity's window to prevent dangerous global warming is rapidly narrowing as humanity's carbon budget – the total amount of carbon dioxide that can be emitted for a likely chance of limiting global temperature rise – diminishes every year. In the same vein, the Inter-Governmental Panel on

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Climate Change (IPCC) stated, in its Fifth Assessment Report (2014), that the world will warm by between 3.7°C to 4.8°C by 2100 if humanity continues to pursue this “business as usual” pathway it is currently on. This level of warming according to the IPCC (2014) would be disastrous for the human civilization. What this therefore means is that all nations of the world must come together and contribute their quota in the fight against climate change.

Currently, the issue of GHG emissions has become a general concern in Nigeria, due to the increasingly devastating effects of climate change on the environment. One of such effects of climate change according to Omole (2013) is rising sea levels occasioned by melting polar ice, which threatens to submerge coastal cities like Lagos and Port Harcourt in the future if nothing is done to mitigate this. Other effects of climate change in Nigeria according to Tasiu (2018) include the spread of water borne diseases and malaria as a result of increased flooding, the rapid shrinking of the Lake Chad in the north-east of Nigeria which threatens the livelihood of millions of Nigerians and increasing desertification in Northern Nigeria which many experts believe is the primary cause of the perennial Farmers-Herders clashes in the country. One of the best ways we can mitigate these effects of climate change not just here in Nigeria but all over the World, is by ensuring sustainability in the building Sector (Tunji, 2018). The only way to ensure sustainability in the building sector according to the Global Alliance for Buildings and Construction, (GABC, 2017), is through the adoption of green practices such as healthy IEQ in buildings, be they private or public buildings.

Public buildings such as hotels, office buildings, commercial buildings, hospitals and health facilities, libraries, sport buildings, religious buildings, public transit buildings and educational buildings are responsible for more than half of the energy consumption by buildings worldwide (Idoro, 2011). This is not just because such buildings are typically larger, but also because of the number of people that use such buildings on a daily basis. By definition, public buildings are regarded as buildings without obstructions. In other words, buildings that people are free to come in and out of as they like. A hotel which is a type of public building refers to a commercial establishment that provides paid lodging, food and other services to the public, usually on a short term basis. Thus, it provides the basic accommodation for visitors. According to the Nigerian Tourism Development Corporation (NTDC) (2018), hotels in Nigeria are classified according to their star ratings and may thus be classified as either one, two, three, four, or five star hotels. Hotels all over the World are known for intensive use of water and energy, and for generating a lot of wastes which if not managed, have a negative impact on the environment and also on the operating costs

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of an organization (Butler, 2013). The adoption of green building practices such as healthy IEQ in hotels does not only reduce their overall operating costs, but it also reduces the amount of waste they generate and thus goes a long way in combating climate change (Boris, 2012).

Climate change represents a clear and present danger to every nation of the world of which Nigeria is no exception. A lot of nations all over the world have adopted green practices such as a healthy indoor environmental quality in their hospitality sector in order to ensure that they do not become losers in the fight against climate. This seems not to be the case in sub-Saharan Africa which Nigeria is a part of because according to Bello (2015), the effects of hotels in sub-Saharan Africa to the environment was estimated to have increased the global GHG emissions by 21%. This fact is attributable to the nature of the hotel business which sees them operating 24 hours a day and 365 days of the year. As a result of this, they end up consuming a lot of resources particularly energy. What this therefore means is that their potential for waste generation is very high and is thus, a source for serious concern. This research was therefore aimed at assessing the healthy indoor environmental quality practices adopted in hotels, particularly in three star hotels in Abuja to improve efficiency in their day to day operations.

Aim and Objectives of the Study

The study aimed to assess the healthy indoor environmental quality practices adopted in three star hotels in Abuja. Specifically, the objectives of the study were to find out the:

1. Healthy indoor environmental quality practices adopted in three star hotels in Abuja.
2. Factors that determine the adoption of healthy indoor environmental quality practices in three star hotels in Abuja.

Theoretical Framework

Unified Theory of Acceptance and use of Technology: This is a technology acceptance theory formulated by Venkatesh, (2003). Though the theory was formulated to determine the factors responsible for user acceptance of Information Technology, it can also be used to determine the factors responsible for user's acceptance of any new product or innovation (Venkatesh, (2003). The theory holds that there are four key constructs, namely: 1. Performance expectancy; 2. Effort expectancy; 3. Social influence; and 4. Facilitating conditions.

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Performance expectancy according to the theory refers to an individual's perception that using a new system will enhance job performance. Factors affecting performance expectancy include: systems effectiveness, systems improvement of work and systems improvement of productivity.

Effort expectancy; according to the theory refers to an individual's perception that using a new system will be free of effort. Factors affecting effort expectancy include: Easiness of accessing the system, smoothness of interacting with the system and systems overall presentation or outline.

Social influence; according to the theory refers to an individual's perception of the degree to which other people approve or disapprove of the target behavior. At this phase, consumer demand for example, can influence decision making. It therefore means that if a hotelier feels that adopting green practices in his hotel will be approved by the society, he is more likely to adopt green practices in the day to day running of his hotel.

Finally, facilitating conditions according to the theory refers to an individual's perception of the factors that impede or facilitate the behavior. Such factors could include government policy, cost of the target behaviour and technological barriers. Since the Unified Theory of Acceptance and use of Technology deals with user behavior and attitudes towards a new system or technology and green technology concepts are relatively new in Nigeria (Smart, 2015), the theory is hereby adopted for this research.

Research Questions

The following research questions guided the study:

1. What are the healthy indoor environmental quality practices adopted in three star hotels in Abuja?
2. What are the factors that determine the adoption of healthy indoor environmental quality practices in three star hotels in Abuja?

Research Hypotheses

The following null hypotheses, tested at 0.05 level of significance further guided the study:

H01. There is no significant difference between the mean ratings of facility managers and registered builders on the healthy indoor environmental quality practices adopted in three star hotels in Abuja.

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H02. There is no significant difference between the mean ratings of facility managers and registered builders on the factors that determine the adoption of healthy indoor environmental quality practices in three star hotels in Abuja.

Methodology

A descriptive survey design was adopted for the study. A descriptive survey design according to Sani (2015), is a descriptive study which uses sample of an investigation to document, describe and explain what is in existent or non-existent on the present status of phenomena being investigated. Sani (2015), further stated that in a descriptive survey study, views and facts are collected through questionnaire, analyzed and used for answering research questions. The design is considered appropriate as the present study sought to assess the healthy indoor environmental quality practices adopted in three star hotels in Abuja, Nigeria. The study was carried out in Abuja, the capital city of Nigeria, located within the Federal Capital Territory (FCT). Abuja was chosen as the area for the study because of the large presence of various hotels in the City. According to the NTDC (2018), there are 183 hotels in Abuja. These comprises of 2 five star hotels, 24 four star hotels, 93 three star hotels, 45 two star hotels and 19 one star hotels. Due to the higher number of three star hotels, they were used for this study. The target population for the study consisted of 93 facility managers of three-star hotels and 34 registered builders from the department of public building, Federal Capital Development Authority (FCDA), all based in Abuja.

Data was collected using a 20 items questionnaire developed by the researcher and known as Questionnaire on Healthy Indoor Environmental Quality Practices in Three-Star Hotels (QHIEQPTSH). The QHIEQPTSH is made up of two parts. Part one contains the introduction and the respondent's personal data while, part two contains the questionnaire and is divided into two sections: A and B. Section A contains research question one which focuses on the healthy indoor environmental quality practices adopted in three star hotels in Abuja and contains 10 items. Section B contains research question two which focuses on the factors that determine the adoption of healthy indoor environmental quality practices in three star hotels in Abuja and also contains 10 items. Sections A and B were structured using four-point rating scales of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). These ratings weighted 4, 3, 2 and 1, beginning from the highest to the lowest respectively.

The instrument was content validated by three experts of building technology education from the department of Industrial and Technology Education, Federal University of Technology Minna, and their comments and suggestions were

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considered in preparing the final draft of the instrument. The instrument was trial tested in Lafia, Nasarawa State, on 16 respondents comprising 9 registered builders from the Nasarawa state urban development board and 7 facility managers of three star hotels located in Lafia, Nasarawa state. The Cronbach alpha coefficient was used to determine the internal consistency of the instrument and 0.80 was obtained as the overall reliability coefficient of the instrument. The instrument was later administered to the respondents by the researcher and a 96% return rate was recorded from the facility managers, while an 74% return rate was recorded from the registered builders. This response rate is considered adequate in both cases because Sani (2015) suggested that a response rate of about 30% was adequate for construction industry studies. Thus, the final population for the study consisted of 89 facility managers and 25 registered builders.

Mean and standard deviation were used to answer the research questions. Mean scores above 2.50 and above were considered Agreed; while mean scores of 2.49 and below were considered Disagreed by the respondents, in accordance with the research questions. Furthermore, Z-test was used to test the hypotheses. Decision was made by comparing the Z-calculated value with that of Z-critical at .05 significance level. Hypothesis was rejected if Z-cal is found to be greater than Z-critical; otherwise it is accepted.

Results

Research Question 1

What are the healthy indoor environmental quality practices adopted in three star hotels in Abuja?

Table 1: Mean and Standard Deviations of the Responses of Facility Managers and Registered Builders on the Healthy Indoor Environmental Quality Practices Adopted in Three Star Hotels in Abuja.

N=114				
S/N	Items Statement on Practices Adopted	\bar{X}_A	SDA	Remarks
1	Provision is made for ventilation in rooms to improve indoor air quality	3.06	0.23	Agreed
2	Air conditioners and electric fans are provided to enhance thermal comfort	3.16	0.37	Agreed
3	Provisions are made for natural and artificial light sources to improve visual comfort	3.05	0.27	Agreed

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4	Smoking of cigarettes is prohibited within hotel premises to enhance indoor air quality	3.25	0.44	Agreed
5	Kitchens are well sealed to prevent release of carbon-dioxide	3.20	0.34	Agreed
6	Bathrooms and laundry rooms are well sealed to prevent excessive buildup of water vapour in the air	3.72	0.90	Agreed
7	Sound level (noise) is controlled within hotel premises to enhance acoustic comfort	3.08	0.26	Agreed
8	Provision of window blinds to control light intensity	2.64	0.55	Agreed
9	Regular maintenance is carried out to replace dead light bulbs and other elements necessary for a healthy indoor environmental quality.	2.66	0.42	Agreed
10	Finishing of walls with paint or other decorative material to improve visual comfort.	3.02	0.17	Agreed

\bar{X}_A = Average mean, SD_A = Average standard deviation

Table 1 shows the healthy indoor environmental quality practices adopted in three star hotels in Abuja. The results reveal that all ten items had their mean values ranging from 2.64 to 3.72 which is above the cut-off point of 2.5, indicating that all ten items were adopted in three star hotels in Abuja to ensure a healthy indoor environmental quality. Furthermore, the table also shows that the standard deviations (SD) of the items are within the ranges of 0.17 to 0.90 indicating that the responses of the respondents were not too far from each other on the healthy indoor environmental quality practices adopted in three star hotels in Abuja. This further strengthens the mean.

Research Question 2

What are the factors that determine the adoption of healthy indoor environmental quality practices in three star hotels in Abuja?

Table 2: Mean and Standard Deviations of the Responses of Facility Managers and Registered Builders on the Factors That Determine the Adoption of Healthy Indoor Environmental Quality Practices in Three Star Hotels in Abuja.

N=114				
S/N	Items Statement on Factors	\bar{X}_A	SDA	Remarks
1	Building material conservation	3.23	0.16	Agreed

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2	Energy conservation	2.89	0.18	Agreed
3	Water conservation	2.65	0.20	Agreed
4	Recycling and waste reduction	3.13	0.21	Agreed
5	Occupant's health and comfort	3.11	0.19	Agreed
6	Cost savings	3.12	0.22	Agreed
7	Competitiveness	3.08	0.17	Agreed
8	Consumer demand	3.12	0.24	Agreed
9	Government policy	3.10	0.12	Agreed
10	Reduced liability risk	3.05	0.23	Agreed

\bar{X}_A = Average mean, SD_A = Average standard deviation

Table 2 shows the factors that determine the adoption healthy indoor environmental quality practices in three star hotels in Abuja. The results reveal that all ten items had their mean values ranging from 2.65 to 3.23 which is above the cut-off point of 2.5, indicating that all ten items were factors that determined the adoption healthy indoor environmental quality practices in three star hotels in Abuja. Furthermore, the table also shows that the standard deviations (SD) of the items are within the ranges of 0.12 to 0.24 indicating that the responses of the respondents were not too far from each other on the factors that determine the adoption of healthy indoor environmental quality practices in three star hotels in Abuja. This further strengthens the mean.

Hypothesis 1

There is no significant difference between the mean ratings of facility managers and registered builders on the healthy indoor environmental quality practices adopted in three star hotels in Abuja.

Table 3: Z-Test Analysis of Mean Ratings of Facility Managers and Registered Builders on the Healthy Indoor Environmental Quality Practices Adopted in Three Star Hotels in Abuja.

Subjects	\bar{X}	SD	N	df	Z-cal	Z-critical	Decision
FM	3.08	0.34	89	112	0.13	1.98	Accepted
RB	3.09	0.36	25				

Level of significance= 0.05

Key: FM= Facility Managers, RB= Registered Builders, \bar{X} = Mean, SD= Standard Deviation and df = Degree of Freedom.

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Results from table 3 reveal that the Z-cal value is 0.13, which is less than the Z-critical value of 1.98 at 0.05 significance level and 112 degree of freedom. Thus, the null hypothesis is accepted. This means that there is no significant difference between the mean responses of facility managers and registered builders on the healthy indoor environmental quality practices adopted in three star hotels in Abuja.

Hypothesis 2

There is no significant difference between the mean ratings of facility managers and registered builders on the factors that determine the adoption of healthy indoor environmental quality practices in three star hotels in Abuja.

Table 4: Z-Test Analysis of Mean Ratings of Facility Managers and Registered Builders on the Factors That Determine the Adoption of Healthy Indoor Environmental Quality Practices in Three Star Hotels in Abuja.

Subjects	\bar{X}	SD	N	df	Z-cal	Z-critical	Decision
FM	3.01	0.22	89	112	0.33	1.98	Accepted
RB	3.03	0.25	25				

Level of significance= 0.05

Key: FM= Facility Managers, RB= Registered Builders, \bar{X} = Mean, SD= Standard Deviation and df = Degree of Freedom.

Results from table 4 reveal that the Z-cal value is 0.33, which is less than the Z-critical value of 1.98 at 0.05 significance level and 112 degree of freedom. Thus, the null hypothesis is accepted. This means that there is no significant difference between the mean responses of facility managers and registered builders on the factors that determine the adoption of healthy indoor environmental quality practices in three star hotels in Abuja.

Discussion of Findings

The findings from research question one reveal that the respondents agreed that all ten healthy indoor environmental quality practices are adopted in three star hotels in Abuja. The practices are; provision is made for ventilation in rooms to improve indoor air quality, air conditioners and electric fans are provided to enhance thermal comfort, provisions are made for natural and artificial light sources to improve visual comfort, smoking of cigarettes is prohibited within hotel premises to enhance indoor air quality, kitchens are well sealed to prevent release of carbon-dioxide, bathrooms and laundry rooms are well sealed to prevent excessive build-up of water vapour in the air, sound

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level (noise) is controlled within hotel premises to enhance acoustic comfort, provision of window blinds to control light intensity, regular maintenance is carried out to replace dead light bulbs and other elements necessary for a healthy indoor environmental quality and finishing of walls with paint or other decorative material to improve visual comfort. Furthermore, analysis of the z-test as seen from table 3 revealed that there is no significant difference in the mean responses of facility managers and registered builders on the healthy indoor environmental quality practices adopted in three star hotels in Abuja. This implies that both facility managers and registered builders do not differ in their opinions on the healthy indoor environmental quality practices adopted in three star hotels in Abuja.

Generally, the findings in research question one could be explained with the unified theory of acceptance and use of technology formulated by Venkatesh (2003). The theory has four constructs namely; performance expectancy, effort expectancy, social influence and facilitating conditions. Therefore, simply put in line with the findings in table research question one, the high mean scores of all the items might be due to hotelier's perception that such practices increase productivity and are liked or approved by hotel customers. This is similar to the performance expectancy and social influence factors of the theory.

The findings from research question two reveal that the respondents agreed that all ten factors determined the adoption of healthy indoor environmental quality practices are in three star hotels in Abuja. The factors are; building material conservation, energy conservation, water conservation, recycling and waste reduction, occupant's health and comfort, cost savings, competitiveness, consumer demand, government policy and reduced liability risk. Furthermore, analysis of the z-test as seen from table 4 revealed that there is no significant difference in the mean responses of facility managers and registered builders on the factors that determined the adoption of healthy indoor environmental quality practices in three star hotels in Abuja. This implies that both facility managers and registered builders do not differ in their opinions on the factors that determined the adoption of healthy indoor environmental quality practices in three star hotels in Abuja.

Generally, the findings in research question two are in harmony with the unified theory of acceptance and use of technology formulated by Venkatesh (2003). All ten factors can be classified under the four constructs of the theory. Thus, building material conservation, energy conservation and water conservation can be classified under the performance expectancy construct of the theory. Similarly, cost savings and competitiveness can be classified under the effort expectancy construct of the theory while, consumer demand can be classified under the social influence construct of the

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theory. Finally, government policy which might be favorable or otherwise can be classified under the facilitating conditions construct of the theory. Thus, it is safe to say that the unified theory for the acceptance and use of technology formulated by Venkatesh (2003) can be used as a framework to identify the factors that determine the adoption of healthy indoor environmental quality practices in three star hotels in Abuja.

Conclusion and Recommendations

The aim of this study was to assess the healthy indoor environmental quality practices adopted in three star hotels in Abuja. The choice of this study area was based on the challenges faced by researchers on identifying the types of healthy indoor environmental quality practices currently adopted in three star hotels in Abuja. Hence, this study has filled the gap in that area.

The findings of this study revealed that 10 healthy indoor environmental quality practices are presently adopted in three star hotels in Abuja. The study also found that 10 factors determined the adoption of healthy indoor environmental quality practices in three star hotels in Abuja. These results therefore show that healthy indoor environmental quality practices have come to stay in three star hotels in Abuja. Hence, strategies should be put in place to ensure that they are also adopted in other categories of hotels in Abuja not just because of environmental concerns, but also because of its capability to increase financial profit and long-term competitiveness of hotels. It is therefore recommended based on these findings that:

1. Healthy indoor environmental quality practices should be adopted in other categories of hotels in Abuja in order to not only ensure the comfort and wellbeing of hotel customers, but to also preserve the environment.
2. Healthy indoor environmental quality practices should be adopted in other types of public buildings as well. This will go a long way in reducing greenhouse gas emissions which will consequently help to mitigate the effects of climate change on the environment.

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