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Shading Devices Effects on the Thermal Comfort of Glassed Buildings

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Abstract

Given the huge potential of the construction sector, it is necessary to renovate a sizable amount of the existing structures based on the trade-offs between energy and thermal comfort. In order to do that, this study investigates how shading devices affect the thermal comfort of glazed structures. In particular, the study looked into aspects that affect shading devices' effects on a building's thermal comfort and assessed how those effects affected glazed residential buildings. A quantitative study design was used, and the research tool of choice for data collection was a questionnaire. Simple percentage analysis was used to examine the acquired data. The finding of the study revealed that roof insulation, and thermal insulation are the factors that influencing shading devices on thermal comfort of glazed building. The finding of the study also revealed that the provision of thermal insulation to the roof and exterior walls together with an update to the glazing system with double glazing showed exceptional levels of efficiency, reducing average energy usage by up to 38%. The study concluded that shading devices has effect on thermal comfort of glazed buildings.

Keywords: Thermal, comfort, glazed, buildings

Introduction

Limiting the impacts of climate change by reducing reliance on fossil fuels for energy is one of the most urgent issues of the twenty-first century. Because of obstacles including increased energy use and the requirement for energy security, energy conservation is a challenging task. A single European strategy has been developed in response to these issues with the aim of maintaining the affordable physical availability of energy goods and services while simultaneously advancing the social objectives and carbon emission reduction targets of the European Union. (EC, 2010). In the European Union, buildings account for about 40% of energy consumption and 36% of greenhouse gas emissions (22 percent for residential and 18 percent for commercial buildings) (EC, 2012).

Initiatives to overhaul the energy system for a decarbonized future across Europe acknowledge the importance of buildings in reducing carbon emissions (EC, 2011a). Up to 68 percent of the energy used in homes is for space cooling. It is obvious that homeowners spend the majority of their energy maintaining pleasant conditions because bad house design and operation. As technology and industrialization advanced, homes became dependent on artificial systems, disregarding the human body's capacity for adaptation (Asif, 2016; Al-zubaydi and Hong, 2019). However, significant energy savings and a decrease in CO2 emissions will be achieved by renovating a sizable section of Europe's housing stock (Baker and Steemers, 2014). To create a renovation plan, the trade-offs between energy and thermal comfort will be considered.

The European Council, in a characteristic statement, stated that meeting energy targets must not come at the expense of thermal comfort and indoor air quality (Al-Obaidi, Ismail and Rahman, 2016). The above established the need to lowering carbon emissions. Furthermore, excessive energy consumption, particularly in the mid-twentieth century, resulted in global warming and climate change. Climate change was, without a doubt, mostly caused by wasteful manmade activity. Particularly, greenhouse gas emissions surged fast in tandem with the industrial revolution, resulting in an intensified greenhouse effect and severe global warming (Houghton, 2009). As a result, the average surface temperature of the world has risen in comparison to 100 years ago.

The importance of thermal comfort on individuals has been demonstrated in the past. However, as previously said, residents are compelled to use artificial systems to create suitable living circumstances. Due to a weak building envelope, an inefficient system, and a lack of energy awareness, this results in energy waste. As previously said, owing to modern lifestyles and buildings, a tendency in mechanical systems has been noted. The interior thermal environment is artificially kept at acceptable levels of comfort, resulting in excessive energy usage, especially during the cold and hot seasons (Karlsen, Heiselberg, Bryn and Johra, 2015). Mechanical systems, on the other hand, use energy based on the difference between the outer climate and the required inside temperature conditions (Alders and Kurvers, 2010). Thermal comfort, or the supply of pleasant

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circumstances, is, in essence, operating as a catalyst in the European energy scene and carbon emissions. Energy-saving measures on the building envelope must be undertaken from a refurbishing standpoint, based on the body's capacity to react to the environment (O' Brien, 2013). As a result, before and after renovations, a thermal comfort assessment must be performed to verify that thermal comfort is maintained or improved, rather than relying on traditional systems.

Based on the foregoing, the current study aims to investigate how shading devices affect the thermal comfort of glazed structures. In particular, the study looked into the variables that affect shading devices' effects on glazed buildings' thermal comfort and assessed how well they worked for the study's glazed residential buildings. Five sections make up the remainder of the essay. The introduction is presented in section one, the procedures and materials are explained in section two, and the findings are shown in section three. Section four discusses the findings, and section five is where the conclusion is found.

Methods and Materials

Quantitative research design was adopted in the study and the population of the study consists of 1874 shopping complexes in Lagos. Stratified sampling is used to choose participants. These strata are made up of various customers that visit the several shopping malls in Lagos State, Nigeria. The study next conducts a random sampling within the stratum. Cross-sectional data was obtained in the Lagos Mainland shopping complex facilities. Customers who visited or used the region's various shopping complexes were handed surveys. The self-administered questionnaires were coded for each LGDA sampled throughout the data collecting phase. The code was inserted in the bottom corner of each of the administered surveys to distinguish between the many categories of clients that visit or utilize the shopping complex amenities in Lagos, Nigeria. Participants were asked to complete a 42-item questionnaire regarding the impact of building thermal comfort on shopping mall operating expenses. Thermal comfort, energy produced, health well-being, infiltration, insulation, fenestration, and residential building thermal comfort were among the 42 components. All items were rated on a 5-point scale (with anchors of 1: strongly agree, 2: agree, 3: not disagree/agree, 4: disagree, and 5: strongly disagree). The data collected was analyzed with SPSS/AMOS version and Simple percentage was adopted as data analysis techniques

Results and Discussion

The results section contains the demographic information of the respondents and the findings of analysis in the study. Table 1 depicts the demographic information of the respondents.

Demographic Information of the Respondents

Table 1: Demographic information Distribution

Shoprite, Ikeja	Frequency	Percentage Representation	Valid Percentage	Cumulative Percentage
A	259	100.0	100.0	100.0
Total	259	100.0	100.0	
Gender	**Frequency**	**Percentage Representation**	**Valid Percentage**	**Cumulative Percentage**
Male	104	40.2	40.3	40.3
Female	154	59.5	59.7	100.0
Missing	1	0.4		
Total	259	100.0		
Age (yrs)	**Frequency**	**Percentage Representation**	**Valid Percentage**	**Cumulative Percentage**
18-25	93	35.9	35.9	35.9
26-35	153	59.1	59.1	95.0
36-45	10	3.9	3.9	98.8
45 above	3	1.2	1.2	100.0
Total	259	100.0	100.0	
No of Years (yrs)	**Frequency**	**Percentage Representation**	**Valid Percentage**	**Cumulative Percentage**
0-1	52	20.1	20.2	20.2
1-2	38	14.7	14.7	34.9
2-3	83	32.0	32.2	67.1
More than 3	84	32.4	32.6	99.6
None	1	0.4	0.4	100.0
Missing	1	0.4	100.0	
Total	259	100.0		

Source: Field Survey (2022)

Gender, age, and the number of times they had been to the shopping centre are among the demographic details of the study's participants' customers, as shown in Table 1.

Gender distribution showed that female respondents had the highest response rate, 59.7%, while male respondents had the lowest response rate, 40.3 percent. The missing value represents the consumer who does not want to disclose their gender.

On the age distribution, customers ranging in age from 12 to 25 years old took part in the study. Customers aged 17 to 19 years old had the greatest response rate of 59.1 percent, followed by customers aged 12 to 16 years old with a response rate of 35.9 percent. Customers between the ages of 23 and 25 had the lowest response rate of 1.2 percent.

Number of years of visiting shopping complex distribution indicated that customers who had visited the shopping center

for a long time were more interested in the research. Consumers with more than three years of experience had the highest response rate (34.4%), followed by customers who had visited the shopping complex for two to three years, who had a response rate of 32.0 percent. Customers with 1 to 2 years of experience gave the lowest response.

Table 2: Thermal Comfort

TL	Thermal Comfort	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
TL1	I find thermal comfort on glazed buildings useful.	42.1	38.6	8.9	4.6	5.8
TL2	The thermal comfort warms me when I walk through the corridor on glazed building.	30.6	43.0	12.4	8.5	5.4
TL3	The thermal comfort on glazed building help control my body temperature.	22.8	40.5	20.1	10.0	6.6

Source: Field Survey (2022)

As indicated in Table 2, Questions concerning thermal comfort were posed to learn how consumers felt about the performance of their building's thermal comfort. The first thing that consumers said was, "I feel that utilising my building's thermal comfort is quite useful" (TL1). Customers believe that utilising their building's thermal comfort is useful, with 42.1 percent strongly agreeing and 38.6 percent agreeing. However, 5.8% of consumers disagree that employing building thermal comfort makes it easier for them to navigate the shopping complex. Customers feel that employing building thermal comfort is extremely useful for walking about the shopping complex comfortably, with 43.0 percent agreeing and 30.6 percent strongly agreeing, while just 5.4 percent strongly disagree. Only 40.5 percent of consumers agree and 22.8 percent strongly agree that using their building's thermal comfort benefits them in Item 3. However, 20.1 percent of customers replied in a neutral manner, while 6.6 percent disagreed.

Table 3: Insulation (IS)

IS	Insulation	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
IS1	The insulation affects the amount of fresh air into the glazed building.	36.7	35.9	12.7	7.3	7.3
IS2	The insulation affects the temperature inside the glazed building.	35.7	37.6	15.9	7.4	3.5
IS3	The insulation helps as much as possible when walking inside the glazed building.	21.2	40.5	23.2	10.0	5.0

Source: Fieldwork (2022)

Table 3 contains the responses on insulation. When asked if the light insulation affects the illuminance in the shopping center, the consumers answered favourably (IS1). Customers strongly agree 36.7 percent of the time, agree 35.9% of the time, and answer neutrally 12.7 percent of the time. 7.3 percent of consumers, however, disagree. Customers were then questioned if the temperature of light in the shopping complex center affected the brightness (IS2). Customers agree 37.6% of the time, strongly agree 35.7 percent of the time, and answer neutrally 15.9% of the time. However, 7.4 percent of buyers disagree.

Customers were once again questioned if the shopping complex center's insulation helps as much as feasible when wandering around the shopping complex (IS3). Customers agree 40.5 percent of the time, strongly agree 21.2 percent of the time, and answer neutrally 23.2 percent of the time. However, 10.0 percent of consumers disagree that leveraging their building's thermal comfort is a good idea.

Conclusion

The study looked at how shading devices affected glazed structures' thermal comfort. In particular, the study looked into the variables that affect shading devices' effects on glazed buildings' thermal comfort and assessed how well they worked for the study's glazed residential buildings. A quantitative study was carried out at the Shoprite shopping centre in the Ikeja local government development area of Lagos, and the data analysis method used was a basic percentage. The provision of thermal insulation to the roof and exterior walls along with an update to the glazing system with double glazing showed exceptional levels of efficiency, reducing average energy usage by up to 38%, according to the study's findings. The study also found that roof insulation and thermal insulation are the factors that influence shading devices on thermal comfort of glazed buildings. The study found that shading devices had an impact on glazed structures' thermal comfort.

References

1. Baker N, Steemers K. *Daylight Design of Buildings: A Handbook for Architects and Engineers*; Routledge: London, UK, 2014.
2. EC. Energy Efficiency Status Report 2012-Electricity Consumption and Efficiency Trends in the EU-27, European Commission, Luxembourg, 2012.
3. ECRC. *Cool Roofs in Europe-Initiatives and Examples, European Cool Roofs*. Council, Pan European, 2010.

4. Hair J, Anderson R, Tatham R, Black W. *Multivariate Data Analysis (*7th ed.). Upper Saddle River, NJ: Prentice Hall, 2009.
5. Hodder SG, Parsons K. The effects of solar radiation on thermal comfort. *Int. J. Biometeorol*. 2007; 1:233-250.
6. Karlsen L, Heiselberg P, Bryn I, Johra H. Verification of simple illuminance-based measures for indication of discomfort glare from windows. *Build. Environ*. 2015; 92:615-626.
7. O'Brien W, Kapsis, K, Athienitis AK. Manually operated window shade patterns in office buildings: A critical review. *Build.Environ.* 2013; 60:319-338.