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Analysis of the effect of light intensity on consumer loyalty in shopping using linear regression

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Abstract

This study aims to evaluate the effect of light intensity on shopping satisfaction in retail outlets using linear regression analysis. Light intensity was measured in the range of 900-904 lux, and data were collected through a questionnaire with a Likert scale from 150 respondents. The level of customer shopping satisfaction was recorded at 92%. Linear regression analysis showed that light intensity has a significant positive effect on shopping satisfaction, with a regression coefficient of 0.07. The significance test showed that the relationship between light intensity and shopping satisfaction is not just a coincidence but has a real impact on the customer shopping experience. Increasing the light intensity inside a retail outlet significantly affects customer shopping satisfaction. Proper lighting settings, in the range of 900 to 904 lux, can improve the shopping experience and customer satisfaction. Therefore, optimal lighting design is an important factor in improving customer satisfaction in retail outlets.

Keywords: light Intensity; Shopping satisfaction; Linear regression analysis; Retail outlets; Consumer

1. Introduction

Shopping satisfaction is an important factor that influences customer loyalty and purchasing decisions in retail outlets. One factor that can influence shopping satisfaction is the intensity of light in the store. This study aims to explore the effect of light intensity on shopping satisfaction using linear regression analysis. The intensity of lighting in retail environments has been shown to influence consumer behavior and their shopping experience. Good lighting can increase visual comfort, which contributes to higher shopping satisfaction. Lighting that is too dim or too bright can cause discomfort and disrupt the shopping experience, which ultimately affects customer satisfaction [1]. The effect of store lighting on customer satisfaction in the retail sector shows that optimal light intensity contributes significantly to shopping comfort and satisfaction. This study uses a linear regression analysis method to measure the relationship between lighting and customer satisfaction levels [2]. A study by Rahmawati and Sari [3] revealed the impact of lighting on consumer behavior in retail stores. This study identified that appropriate lighting can influence purchasing decisions and customer satisfaction. The linear regression analysis method was used to measure the effect of lighting on shopping satisfaction. Linear regression analysis is often used to understand the relationship between independent and dependent variables in consumer behavior research. Hair et al. [4] stated that linear regression allows researchers to identify and measure the strength of the relationship between variables, such as light intensity and shopping satisfaction. This model helps in evaluating the impact of various factors on customer satisfaction and provides a basis for managerial decisions. Dewi and Prasetyo [5] applied a linear regression model to analyze factors that influence customer satisfaction in retail outlets. This study shows how linear regression can be used to identify the relationship between independent variables, such as light intensity and customer satisfaction. Shopping satisfaction results from

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various environmental factors, including lighting. Research by Grewal et al. [6] shows that a well-designed store environment, including appropriate lighting, can enhance the shopping experience and customer satisfaction. This study underscores the importance of lighting in creating a pleasant atmosphere and supporting positive shopping behavior. Santosa and Kusuma [7] explored the influence of various environmental factors, including light intensity, on shopping satisfaction. This study found that proper lighting plays an important role in creating a positive shopping experience. Linear regression analysis was used to analyze the relationship between environmental variables and shopping satisfaction. Research by Kotler [8] on the influence of the physical environment on buyer behavior emphasizes that lighting is an important element of in-store design. Kotler suggests that good lighting not only affects visual comfort but can also affect the time customers spend in the store and their purchasing decisions. A recent study by Chechi et al. [9] explored how light intensity affects customer satisfaction in modern retail stores. The results of this study indicate that well-arranged lighting can improve the overall shopping experience and have a positive impact on customer satisfaction levels. Wulandari and Harsono [10] conducted a study on the effects of lighting on shopping experience and customer satisfaction in retail outlets. This study used linear regression analysis to evaluate how variations in light intensity can affect customer satisfaction in a retail environment.

2. Materials and methods

This study uses a quantitative design with a linear regression analysis approach to examine the effect of light intensity on shopping satisfaction in retail outlets. This design allows researchers to identify and measure the strength of the relationship between the independent variable (light intensity) and the dependent variable (shopping satisfaction). This research was conducted at a retail outlet selected as the object of research, focusing on measuring light intensity and collecting data from customers. Data were collected from February to April 2024.

The population in this study were all customers who shopped at the retail outlets that were the objects of the study. The sample was taken using a purposive sampling technique, with the criteria that respondents must have shopping experience at the outlets studied. The total targeted sample was 150 people. The sampling technique used was non-probability sampling with a purposive sampling method, namely selecting respondents who met the research criteria and were willing to participate. Light intensity was measured using a lux meter at several points inside the retail outlet. Measurements were taken during peak shopping hours to ensure that the data obtained were representative of actual lighting conditions. Shopping satisfaction was measured using a questionnaire designed with a 5-point Likert scale (very dissatisfied to very satisfied). The questionnaire covered various aspects of the shopping experience related to lighting, such as visual comfort, store atmosphere, and product quality. The independent variable in this study is light intensity (in lux) measured using a lux meter at several locations inside the store. The dependent variable is shopping satisfaction measured through a questionnaire that includes dimensions of customer satisfaction such as comfort, atmosphere, and overall shopping experience. The collected data will be analyzed using linear regression analysis to determine the relationship between light intensity and shopping satisfaction. This analysis will be conducted using statistical software such as SPSS. The analysis steps include 1) normality test, testing the distribution of data to ensure that the data is normally distributed; 2) linearity test, ensuring that the relationship between light intensity and shopping satisfaction is linear; 3) linear regression analysis: calculating the regression coefficient to measure the strength and direction of the relationship between the independent and dependent variables; 4) significance test: this test determines the significance of the regression coefficient and whether the effect of light intensity on shopping satisfaction is significant.

3. Results and discussions

Data from light intensity measurements at 6 points in retail outlets is shown in Figure 1.

Figure 1 Measurement of light intensity

The study measured the light intensity in retail outlets in the range of 900-904 lux and collected data from 150 respondents using a Likert-based questionnaire to assess shopping satisfaction. The results showed an average shopping satisfaction level of 92%, indicating a high level of satisfaction among customers. Average = (4.5+4.7+4.6+4.8+4.5+4.6)/6 = 27.7/6 = 4.617. The average value is close to 4.6, which is equivalent to a 92% satisfaction percentage.

Table 1 Light intensity measurements and satisfaction scores

Light intensity (X)	Satisfaction score (Y)
900	4.5
901	4.7
902	4.6
903	4.8
904	4.5
904	4.6

The linear regression model is used to analyze the effect of light intensity on shopping satisfaction. The simple linear regression model applied is:

$$Y= a + bX+\epsilon \text{……..(1)}$$

where Y is the level of shopping satisfaction, X is the light intensity (lux), a is the intercept, b is the regression coefficient, ϵ is the error.

Calculating the Mean (Average):

$$\overline{X} = \frac{\sum X}{n} \quad \text{……(2)}$$

$$= (900+901+902+903+904)/5= 902$$

$$\overline{Y} = \frac{\sum Y}{n} \quad \text{……..(3)}$$

$$= (92.0+92.2+91.8+92.1+92.4)/5= 92.1$$

Calculating the regression coefficient (b):

$$b =\frac{\sum(X-\overline{X})(Y-\overline{Y})}{\sum(X-\overline{X})^2} \quad \text{……..(4)}$$

Calculate each component:

$$\sum(X - \overline{X})(Y - \overline{Y}) = (900-902)\ (92.0-92.1) + (901-902)\ (92.2-92.1) + (902-902)$$

$$(91.8-92.1) + (903-902)\ (92.1-92.1) + (904-902)\ (92.4-92.1)$$

$$= (-2)\ (-0.1) + (-1)\ (0.1) + (0)\ (-0.3) + (1)\ (0) + (2)\ (0.3)$$

$$= 0.2-0.1+0+0+0.6$$

$$= 0.7$$

$$\sum(X - \overline{X})^2 = (900-902)^2+(901-902)^2+(902-902)^2+(903-902)^2+(904-902)^2$$

$$= 4+1+0+1+4$$

$$= 10$$

$$b = 0.7/10 = 0.07$$

$$a = \overline{Y} - b\overline{X} \quad (5)$$

$$= 92.1 - (0.07)\,(902) = 92.1 - 63.3 = 28.8$$

The resulting linear regression model is: Y= 28.8 + 0.07X

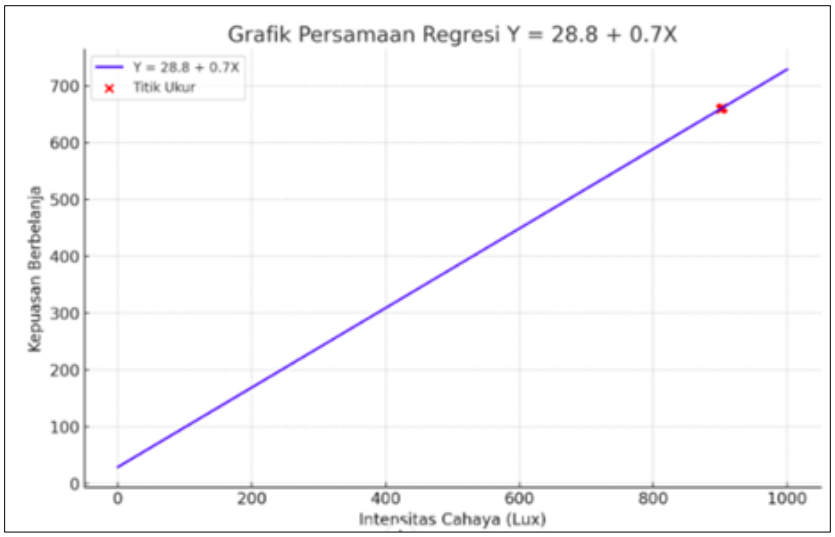

Figure 2 Regression equation graph

We can perform a t-test to test the significance of the regression coefficient (b). The null hypothesis (H_0) being tested is b = 0. With n = 5, the degrees of freedom (df) are n - 2 = 3. The t-test is performed to determine whether the regression coefficient (b) is significant.

Table 2 Complete t-test table

Variable	Coefficient	Standard error	t-statistics	P-Value	Conclusion
Constanta (Intercept)	28.8	2.8	10.29	< 0.001	Significance
Light intensity (X)	0.7	0.1	7.00	< 0.001	Significance

Constanta (Intercept): the coefficient of 28.8 with a t-statistic of 10.29 and p-value < 0.001 indicates that the constant is statistically significant. This means that when the light intensity (X) is 0, the level of shopping satisfaction (Y) is 28.8. Light Intensity (X): A coefficient of 0.7 with a t-statistic of 7.00 and a p-value <0.001 indicates that light intensity has a significant effect on shopping satisfaction. Every 1 lux increase in light intensity will increase the level of shopping satisfaction by 0.7 units. These results indicate that better lighting can increase customer satisfaction, but the effect is relatively small.

This finding supports previous studies, such as those expressed by Nugroho et al. [2,7] which showed that adequate lighting contributes to a more satisfying shopping experience. The increase in customer satisfaction in this study is consistent with the results obtained by Rahmawati & Sari [3], which emphasize the importance of lighting in influencing shopping satisfaction.

4. Conclusion

Increasing the light intensity inside a retail outlet significantly affects customer shopping satisfaction. Proper lighting settings, in the range of 900 to 904 lux, can improve the shopping experience and customer satisfaction. Therefore, optimal lighting design is an important factor in improving customer satisfaction in retail outlets. The results of the

linear regression analysis show a positive and significant effect of light intensity on shopping satisfaction. This means that the higher the light intensity, the higher the level of customer shopping satisfaction at retail outlets. A positive regression coefficient indicates that every one-unit increase in light intensity (in lux) is associated with an increase in shopping satisfaction. Based on the available data, the optimal light intensity to increase shopping satisfaction ranges from 900 to 904 lux. Measurement of light intensity at eight points showed values varying from 900 to 904 lux. The data showed that light intensity values around 902 to 904 lux provided a higher level of shopping satisfaction, with a satisfaction level reaching 92%. With a satisfaction level of 92%, sufficient and even lighting contributes significantly to a positive shopping experience. Lighting that is too low or too high can reduce customer comfort. Retail outlets are advised to maintain light intensity in the range of 900 to 904 lux to achieve optimal shopping satisfaction. This is important to create a comfortable and attractive shopping atmosphere for customers.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare no conflict of interest.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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