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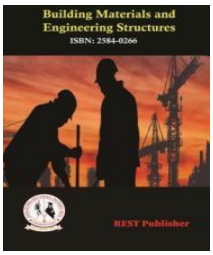

Analysis of Indoor Environment Quality using the SPSS Method

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Abstract: *The assessment and measurement of various factors involving the quality of the air, lighting, temperature, vibration, and ergonomically in order to guarantee a pleasant and healthy indoor environment can be referred to as indoor Environment Quality Analysis. The investigation and assessment of parameters such as the quality of the air, lighting, temperature, noise, and ergonomic situations in order to assess the overall health and comfort of interior environments are included in the examination of indoor environment quality. It entails assessing these features in order find any potential concerns or adjustments that could be beneficial to create a more suitable and ecological interior environment. The evaluation of the quality of the indoor environment is essential for research since it allows for comprehension and determination of variables that influence human well-being, ease, and efficiency in indoor spaces, which leads to the creation of tactics and measures to produce more sustainable and healthier constructed environments. In addition, it elucidates the connection between the quality of indoor air, energy conservation, and the impact on the environment, enabling the execution of solutions that enhance human health and the sustainability of the environment. SPSS (Statistical Package for the Social Sciences)" has become an internationally recognized statistical software that provides a variety of methods and instruments for data analysis, manipulation, and display, making it useful in a variety of study topics. SPSS's user-friendly interface and vast capabilities enable researchers to explore and analyses data, run statistical tests, create descriptive statistics, and visualize results, allowing for rigorous and meticulous statistical analysis. In this case, you have reported two values of Cronbach's Alpha: .815 and .821. The first value, .815, represents Cronbach's Alpha calculated based on the raw items, while the second value, .821, represents Cronbach's Alpha based on standardized items. Both values indicate a reasonably good level of internal consistency reliability. Generally, a Cronbach's Alpha coefficient of .70 or higher is considered acceptable, and values above .80 are often regarded as good.*

Keywords: *Indoor Environment Quality, SPSS, Water Quality, and Air Quality.*

1. INTRODUCTION

Based on the personal poll results, customers are happier about the IEQ of green retail complexes than with conventional mall buildings. Human characteristics like subjective thinking impact how satisfied consumers are with interior settings. Customers' delight with the atmosphere inside declines as the length of their stay expands, and those who are middle-aged around ages 30 and 50 have higher standards for interior temperature climate. People are more accepting of IEQ if they perceive a green commerce structure [1]. In the present research, we make use of a connected device for analysing the amount and coefficients of correlation of the indoor environment and air quality concentration by season & location. Indoor pollution was worse in the spring than in the wintertime, and the office center's placement was worse compared to the adjacent door and windows. Nevertheless, the typical interior pollution evaluation was less than the WHO needs [2]. Humans spent over ninety percent of their waking hours inside the majority of the globe. The combination of the setting, the temperature of the structure's ventilation system, and its building people results in the interior atmosphere. As rising building tension, higher use of supplies that use renewable resources, and a greater need for energy for achieving a pleasant environment, the number of connected worries has grown in the past few years [3]. A precise information capture card was implemented to calibrate the data system. Tests have been carried out in a public computer room inside a commercial facility applying the arsenal of instruments to assess IEQ effectiveness. According to the data gained, thermal convenience, quality of indoor air, and lighting efficiency were investigated. The research verified the toolbox's trustworthiness and durability for ongoing evaluation of the quality of indoor

environments [4]. In the current research, pictures of the interior environments of 7 Italian schools were snapped, with the main physical variables (temperature, moisture, illumination, CO2 concentration, etc.) calculated as well as students were seeking to express their satisfaction with the surroundings of the educational institution, the interaction with the structure (open doors, illumination, functional shades, etc.) and what they did when discomfort took place, with the goal of finding the connection among human well-being and the environment[5].

"Indoor environmental quality (IEQ)" is the state of a building's surroundings in connection to the thermal comfort (TC), wellness, and happiness of its inhabitants. Several complicated related parameters affect IEQ. Knowing the root causes of interior environment stress and modelling them properly may frequently prevent multiple challenges throughout the construction phase. By improving IEQ sub-components, developers can raise the worth of the structure and the pleasure of future citizens [6]. The result of this study suggests that, although the creation and implementation of new building sensors and HVAC management systems could allow completely automatic IEQ oversight, these kinds of innovations should not endanger occupants' feeling that they have some influence over their indoor surroundings [7]. The present research evaluated the perceived significance and efficacy of thirteen IEQs, such as six ecological (temperature, quality of air, moisture, sunlight, artificial lighting, acoustic excellence) as well as seven building (space layout, space size, decor, the inside coatings, confidentiality, view, as well as cleanliness). The analysis of gaps and IPA matrix findings gave helpful data on the effectiveness of IEQs for LEED-certified buildings. Previous investigations have shown the advantages of LEED buildings, as well as LEED buildings are considered as providing healthier and more pleasant indoor environments with enhanced IEQs when contrasted with traditional structures [8]. Building interior environmental quality (IEQ) is usually evaluated using four parameters: temperature control, indoor quality of air (IAQ), level of noise, and illumination level. Two common methods for investigating indoor environmental quality in existing buildings are field tests and questionnaire surveys. Field evaluation, in general, measures physical factors like humidity, temperature, and airflow, while questionnaires investigate experiences that are subjective [9].

Most home building designs have not previously considered the total interior quality of the environment (IEQ) in terms of occupant acceptability. In the present investigation, 125 residents assessed the total IEQ of apartment buildings in Hong Kong as follows in four areas: warmth, indoor air quality, comparable noise level, and illumination level. The results revealed that the operative temperatures, CO2 concentration, equivalent noise level, and lighting level all had an important effect on overall IEQ acceptableness. Thermal as well as aural environmental variables were considered to be the most significant contributions based on total votes, while the quality of indoor air was deemed to be least pertinent [10]. As opposed to conventional mechanical techniques to regulate the humidity level in the indoor environment, which are extremely resource intensive, the produced combined absorbs and disappears moisture naturally based on the humidity level difference in the indoor surroundings and the material itself, eating no energy in the process. In addition, as compared to standard sterilization methods which employ dangerous substances like chlorine dioxide, formaldehyde, or ethylene oxide, the synthesized compound is harmless for inhabitants' safety and for the ecosystem. Additionally, this combo exhibits photocatalytic capacity and offers a chance to break down chemicals apart from microbes, leading to additional advantages [11]. The findings of the research allowed us to reach two major conclusions about the housing sector: The data pointed out by the present research in terms of the effects both geographical & human factors have upon the general state of IEQ may be used for better building design. Furthermore, bad IAQ measurements were regularly discovered to be compromising the health of those inside, stressing the necessity for a web-based post-occupancy monitoring system with adaptive alarm or actuation features [12]. The current research looked examined what were the most cost-effective levels of energy consumption and indoor environmental quality for a partially detached family house in "Timisoara", "Romania". The built home was determined as an affordable substitute for residential nearly zero-energy constructions in Romania by the cost-optimal research [13]. Nevertheless, to the constraints on this investigation, complex architectural characteristics like the form factor and other indoor atmosphere indexes including as acoustic and quality of air have not been taken into consideration at this juncture. These shortcomings will be handled in the writers' future written works [14]. The atmosphere of an office in the city of Hong Kong is usually created according to standards of design as well as practices for the well-being of the workers. Until now, sure local design did not take into consideration total indoor environmental quality (IEQ) in workplaces as a matter of user acceptance [15]. The research paper outlines the outcomes of a one-year assessment of indoor environment characteristics (temperature, humidity level, and carbon dioxide percentage) in exhibit rooms of a Polish museum at various times of each year, as well as the findings of simulations on the thermal simulation of a framework. The impact of a temperature management approach on the cooling and heating demands in gallery rooms was looked into [16]. The suggested approach can be helpful for measuring total class engagement in colleges. It may help authorities with ensuring effective and enhancing indoor environmental quality. The methods can also be applied in different organizations and institutes. Depending on the offered forecasting calculations, it is particularly useful for planning spaces inside [17]. The results of the simulation indicated that customers might profit from the environment and design passive concepts. To accom-

plish these objectives, users have to be able to track and handle external and inside conditions in an instantaneous fashion [18]. Whenever the interior climates of cold regions, warm summer zones, and cold winter zones are contrasted, it turns out that the interior operational temperature in structures across all climates almost maintains an acceptable range in both summer and winter seasons because of the use of air conditioning and heating HVAC systems [19]. It came to light when enhancing indoor air quality (IEQ) in workplaces resulted in an immediate boost in productivity. A number of investigations have demonstrated that employee pay is frequently higher than the exploitative cost of a structure. Around the world, potential health and productivity gains continue to be included in the overall price of construction. Commercial facility managers are becoming more interested in enhancing the internal quality of air [20].

2. MATERIALS AND METHOD

Indoor water quality refers to the characteristics and condition of water used within a building or enclosed space. It encompasses factors such as cleanliness, chemical composition, microbial content, and potential contaminants. Maintaining good indoor water quality is crucial for the health and well-being of occupants.

Several aspects are essential to consider when assessing indoor water quality:

1. Potable water: Potable water refers to water that is safe for drinking and other domestic uses. It should meet specific quality standards set by regulatory bodies to ensure it is free from harmful substances, pathogens, and excessive levels of contaminants.
2. Water sources: The source of water supply can influence its quality. Common sources include municipal water systems, well water, or stored rainwater. Each source may have its own set of potential contaminants or treatment requirements.
3. Plumbing infrastructure: The plumbing system within a building plays a significant role in maintaining water quality. Old or corroded pipes can introduce impurities or affect the taste and odor of the water. Regular inspections and maintenance of plumbing systems are necessary to prevent contamination.
4. Microbial contamination: Microorganisms, such as bacteria, viruses, and fungi, can proliferate in water and pose health risks. Stagnant water, inadequate disinfection, or warm temperatures can create an environment conducive to microbial growth. Regular monitoring and appropriate disinfection measures are crucial to prevent microbial contamination.
5. Chemical contaminants: Indoor water quality should be assessed for the presence of chemical contaminants. These may include heavy metals, pesticides, volatile organic compounds (VOCs), disinfection byproducts (DBPs), and other pollutants. Sources of contamination can include external environmental factors, plumbing materials, or improper storage practices.

To maintain good indoor water quality, it is recommended to:

- Regularly test water for potential contaminants and maintain records of water quality measurements.
- Ensure proper maintenance and cleaning of water storage tanks, filters, and treatment systems.
- Regularly flush and disinfect stagnant or infrequently used water outlets to prevent microbial growth.
- Install appropriate filtration systems or treatment technologies, if necessary, based on the specific water quality concerns.
- Adhere to local regulations and guidelines regarding water quality standards and testing requirements.

By prioritizing indoor water quality, building occupants can enjoy safe and healthy water for drinking, cooking, bathing, and other everyday activities within the indoor environment.

Water Quality: The physical, biological, and chemical characteristics that water has that impact its ability to function for various uses including consumption, agriculture, and the health of ecosystems are commonly referred to as the quality of water.

Air Quality: The state of the atmosphere in regard to contaminants, including particles, gases, and poisons, which may have an effect on both people and the surroundings, is known as the quality of the air.

Sound Performance: The examination and assessment of sound variables such as quantity, rate, and overall quality to assess their appropriateness, information, and intensity in different circumstances or purposes is known as sound performance.

Comfortable Lighting: The implementation of lighting conditions such as suitable brightness, colour temperatures, and glare management that strengthen the viewing decrease strain on the eyes and create an enjoyable atmosphere in interior spaces is referred to as pleasant lighting.

Magnetic Field Radiation: Magnetic field radiation is the existence of electromagnetic waves produced by electrical appliances and transmission lines, that may have negative effects on health and need to be assessed for security.

Method: SPSS has an intuitive user interface that allows it to be used by anyone with varied levels of statistical competence. The software allows for the import of data from a variety of sources, including spreadsheets and databases, simplifying the incorporation and evaluation of distinct data Investigators can use SPSS to carry out descriptive statistics to summarise and explore data, such as implies averages, and standard deviations. "SPSS" has an array of statistical techniques, such as t-tests, ANOVA, regression analyses, factor evaluation, and statistical clustering, which enable investigators to discover links and patterns in their data. The program allows researchers to create customizable graphs and tables in order to communicate what they have found in an aesthetically appealing and useful method.SPSS provides an enormous user community and rich documentation, including user direct guides, and discussion boards, which makes it easy for academics to get assistance and learn about the features of the software.

3. RESULT AND DISCUSSION

TABLE 1. Descriptive Statistics

	N	Range	Minimum	Maximum	Sum	Mean		Std. Deviation	Variance
Water quality	149	4	1	5	654	4.39	.075	.913	.834
Air quality	148	4	1	5	633	4.28	.076	.925	.855
SoundPerformance	147	4	1	5	624	4.24	.073	.880	.775
Comfortable Lighting	146	4	1	5	614	4.21	.071	.862	.744
MagneticField Radiation	149	4	1	5	553	3.71	.083	1.009	1.018
Valid N (listwise)	143								

Table 1 shows the descriptive statistics values for analysis N, range, minimum, maximum, mean,standard deviation and Water quality, air quality, sound performance, comfortable lighting, magnetic field radiation and valid N.

TABLE 2. Frequency Statistics

		Water quality	Air quality	Sound Performance	Comfortable Lighting	Magnetic Field Radiation
N	Valid	149	148	147	146	149
	Missing	0	1	2	3	0
Median		5.00	5.00	5.00	4.00	4.00
Mode		5	5	5	5	3
Percentiles	25	4.00	4.00	4.00	4.00	3.00
	50	5.00	5.00	5.00	4.00	4.00
	75	5.00	5.00	5.00	5.00	5.00

Table 2 shows the Frequency Statistics of the Analysis of Indoor Environment Quality where water quality, Air Quality, Sound Performance, Comfortable

TABLE 3. Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.815	.821	5

Table 3 shows the Table 3 shows the Cronbach's Alpha Reliability result. The overall Cronbach's Alpha value for the model is .821 which indicates 82% reliability. From the literature review, the above 50% Cronbach's Alpha value model can be considered for analysis.

TABLE 4. Reliability Statistic Individual Cronbach's Alpha values

Water quality	.754
Air quality	.747
Sound Performance	.756
Comfortable Lighting	.774
Magnetic Field Radiation	.854

Table 4 Shows the Reliability Statistic individual parameter Cronbach's Alpha Reliability results. The Cronbach's Alpha value forWater quality.754, Air quality .747, Sound Performance.756, Comfortable Lighting.774and Magnetic Field Radiation .854this indicates all the parameter can be considered for analysis.

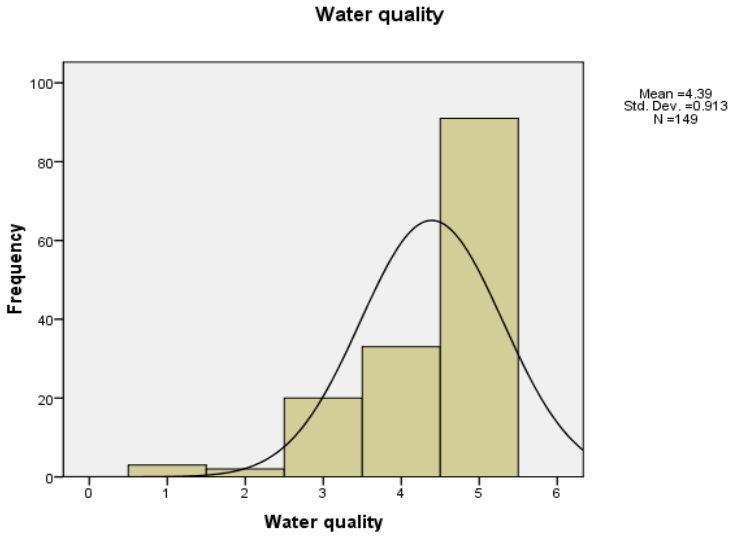

FIGURE 1. Water Quality

Figure 1 shows the histogram plot for Water Quality from the figure it is clearly seen that the data are slightly Right skewed due to more respondent chosen 5 for Water Quality except the 3 value all other values are under the normal curve shows model is significantly following normal distribution.

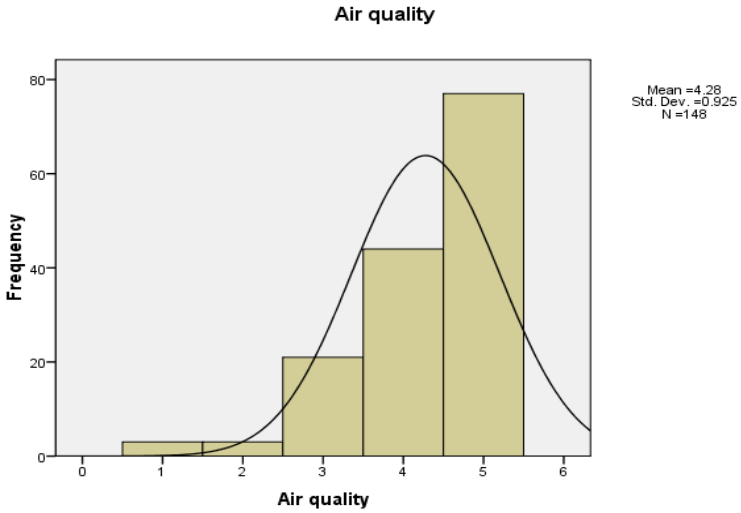

FIGURE 2. Air Quality

Figure 2 shows the histogram plot for Air Quality from the figure it is clearly seen that the data are slightly right skewed due to more respondent chosen 5 for Water Quality except the 2 value all other values are under the normal curve shows model is significantly following normal distribution.

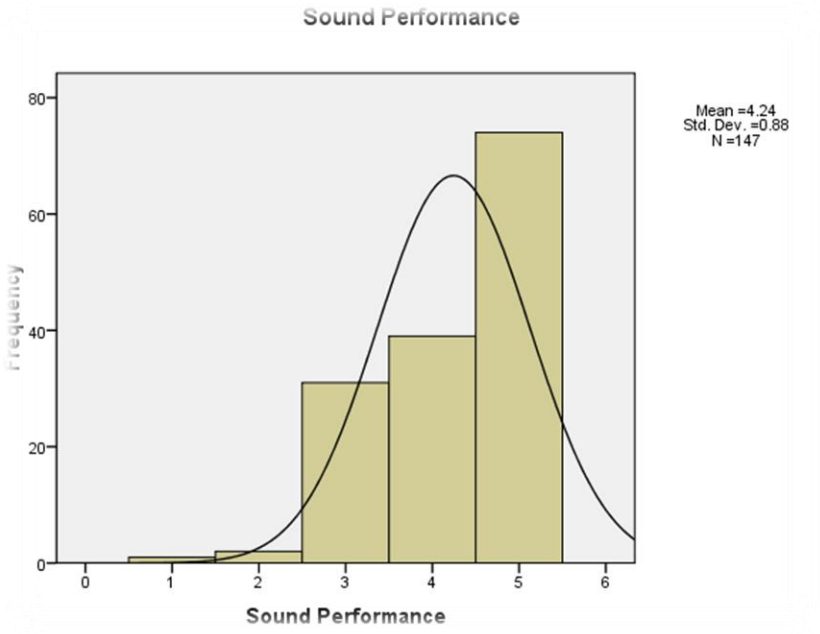

FIGURE 3. Sound Performance

Figure 3 shows the histogram plot for Sound Performance from the figure it is clearly seen that the data are slightly Right skewed due to more respondent chosen 5 for Sound Performance except the 2 value all other values are under the normal curve shows model is significantly following normal distribution.

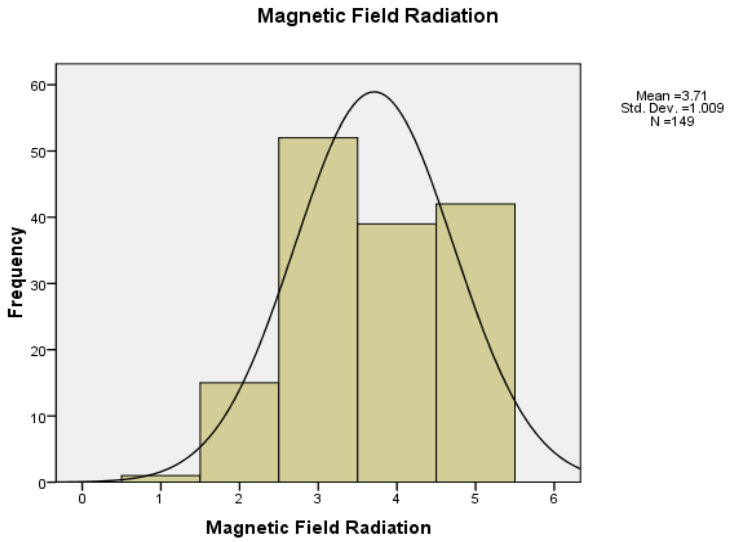

FIGURE 4. Magnetic Field Radiation

Figure 4 shows the histogram plot for Magnetic Field Radiation from the figure it is clearly seen that the data are slightly Left skewed due to more respondent chosen 3 for Diversity except the 2 value all other values are under the normal curve shows model is significantly following normal distribution.

TABLE 5. Correlations

	Water quality	Air quality	Sound Performance	Comfortable Lighting	Magnetic Field Radiation
Water quality	1	.774**	.605**	.526**	.203*
Air quality	.774**	1	.537**	.638**	.230**
Sound Performance	.605**	.537**	1	.454**	.485**
Comfortable Lighting	.526**	.638**	.454**	1	.318**
Magnetic Field Radiation	.203*	.230**	.485**	.318**	1

The table 5 shows the correlation coefficients between different factors: water quality, air quality, sound performance, comfortable lighting, and magnetic field radiation. Correlation coefficients range from -1 to 1, where 1 represents a perfect positive correlation, -1 represents a perfect negative correlation, and 0 represents no correlation. The correlation coefficients provided in the table indicate the relationships between different factors: water quality, air quality, sound performance, comfortable lighting, and magnetic field radiation. Water quality shows a strong positive correlation with air quality (0.774**), indicating that when water quality is good, air quality tends to be good as well. There is also a moderate positive correlation between water quality and sound performance (0.605**), suggesting that better water quality is associated with better sound performance. Additionally, there is a moderate positive correlation between water quality and comfortable lighting (0.526**), implying that higher water quality may contribute to more comfortable lighting conditions. However, the correlation between water quality and magnetic field radiation is relatively weak (0.203*), suggesting a minimal association between the two factors. Similarly, air quality exhibits a strong positive correlation with water quality (0.774**) and a moderate positive correlation with sound performance (0.537**) and comfortable lighting (0.638**). This implies that improvements in air quality are likely to be accompanied by better water quality, sound performance, and comfortable lighting. The correlation between air quality and magnetic field radiation is relatively weak (0.230**). Sound performance shows a moderate positive correlation with water quality (0.605**) and air quality (0.537**), indicating that better sound performance tends to be associated with higher water and air quality. Sound performance also has a moderate positive correlation with comfortable lighting (0.454**) and magnetic field radiation (0.485**), suggesting that these factors may have some influence on sound performance. Comfortable lighting demonstrates a moderate positive correlation with air quality (0.638**) and a moderate positive correlation with sound performance (0.454**), indicating that better air quality and sound performance are associated with more comfortable lighting conditions. The correlation between comfortable lighting and water quality (0.526**) is also positive, but slightly weaker. The correlation between comfortable lighting and magnetic field radiation is relatively weak (0.318**). Magnetic field radiation shows the weakest correlations with the other factors. It has a weak positive correlation with water quality (0.203*) and air quality (0.230**), a moderate positive correlation with sound performance (0.485**), and a weak positive correlation with comfortable lighting (0.318**). Overall, the correlation coefficients suggest that water quality, air quality, sound performance, and comfortable lighting are interrelated factors, with positive associations between them. Magnetic field radiation appears to have weaker correlations with the other factors, indicating a less pronounced relationship.

4. CONCLUSION

In conclusion, maintaining good indoor water quality is vital for creating a healthy and safe indoor environment. Factors such as potable water, water sources, plumbing infrastructure, microbial contamination, and chemical contaminants should be considered when assessing and improving water quality. Regular testing and monitoring of water quality, along with proper maintenance of plumbing systems and disinfection practices, are essential for ensuring the safety of occupants. Addressing issues such as microbial growth, chemical contaminants, and potential sources of water pollution is crucial for maintaining high indoor water quality standards. By prioritizing indoor water quality, building owners, facility managers, and occupants can promote a healthier living and working environment. Access to clean and safe water for drinking, cooking, hygiene, and other activities is essential for the overall well-being of individuals within indoor spaces. The reliability analysis was conducted on a set of 5 items, but the specific nature of these items is not mentioned. However, based on the provided statistics, it can be inferred that the set of items shows relatively good internal consistency, suggesting that they are measuring the same underlying construct consistently.

REFERENCES

[1]. Du, Xiaohui, Yongchao Zhang, and Zhengquan Lv. "Investigations and analysis of indoor environment quality of green and conventional shopping mall buildings based on customers' perception." *Building and Environment* 177 (2020): 106851.

[2]. Son, Jongkwon, and Young-Sung Son. "A correlation analysis of indoor environmental quality and indoor air quality using IoT." In *2019 International conference on information and communication technology convergence (ICTC)*, pp. 977-979. IEEE, 2019.

[3]. KUMAR, KRN KIRAN, and VAKA MURALI MOHAN. "AN EXHAUSTIVE REVIEW ON ACCOMPLISHMENTS IN THE EXPLORATION ZONE OF PICTURE RECOVERY IN CONTENT BASED PICTURES."1(10) 2016, 182 – 189.

[4]. Abhishek, M. B., Rajesh Gadipuuri, Surjeet, Hiteshwari Sabrol, Vipul Dalal, Archna Ratnaparkhi, and Ramesh Krishnamaneni. "A hybrid soft computing approach to analyze and forecast financial risks." *International Journal of Information Technology* (2025): 1-8.

[5]. Karad, Sachin C., and Deepak Waikar. "WIRELESS CHARGING TECHNIQUES FOR ELECTRICAL VEHICLE APPLICATIONS." 8(4), 2021, 15-20.
[6]. Partheeban, Pachaivannan, M. Shiva, J. Vishnupriyan, R. Ponnusamy, T. Sathish Kumar, and Baskaran Anuradha. "Solar Energy optimisation using IoT and deep learning-a review." In *2022 International Conference on Data Science, Agents & Artificial Intelligence (ICDSAAI)*, vol. 1, pp. 1-3. IEEE, 2022.
[7]. Sakhare, V. V., and R. V. Ralegaonkar. "Indoor environmental quality: Review of parameters and assessment models." *Architectural Science Review* 57, no. 2 (2014): 147-154.
[8]. Karami, Majid, Gabrielle Viola McMorrow, and Liping Wang. "Continuous monitoring of indoor environmental quality using an Arduino-based data acquisition system." *Journal of Building Engineering* 19 (2018): 412-419.
[9]. De Giuli, Valeria, Osvaldo Da Pos, and Michele De Carli. "Indoor environmental quality and pupil perception in Italian primary schools." *Building and Environment* 56 (2012): 335-345.
[10]. Piasecki, Michał, Krystyna Kostyrko, and SławomirPykacz. "Indoor environmental quality assessment: Part 1: Choice of the indoor environmental quality sub-component models." *Journal of Building Physics* 41, no. 3 (2017): 264-289.
[11]. Annapurna, D. "Efficient data transmission model for internet of things application." In *2021 Third International Conference on Intelligent Communication Technologies and Virtual Mobile Networks (ICICV)*, pp. 343-348. IEEE, 2021.
[12]. Singh, D. Narendar, C. Murugamani, Pravin R. Kshirsagar, Vineet Tirth, Saiful Islam, Sana Qaiyum, B. Suneela, Mesfer Al Duhayyim, and Yosef Asrat Waji. "IOT based smart wastewater treatment model for industry 4.0 using artificial intelligence." *Scientific Programming* 2022 (2022).
[13]. Chahal, Gurmeet, A. Ranjith Kumar, Ravi Prakash Modanwal, Ankit Kumar, and Govind Singh Rautela. "CNN-RNN based Image-Text Interactions for Image Captioning." *Annals of the Romanian Society for Cell Biology* 25, no. 4 (2021).
[14]. Shrivastava, Neeraj, Pushpa Tewari, S. Sujatha, Srinivasa Rao Bogireddy, Neeraj Varshney, and Vinod Sharma. "Natural Language Processing for Conversational AI: Chatbots and Virtual Assistants." In *2025 IEEE International Conference on Interdisciplinary Approaches in Technology and Management for Social Innovation (IATMSI)*, vol. 3, pp. 1-6. IEEE, 2025.
[15]. Manikandan, G., G. Bhuvaneswari, and M. Robinson Joel. "Artificial Intelligence to the Assessment, Monitoring, and Forecasting of Drought in Developing Countries." In *2023 International Conference on Circuit Power and Computing Technologies (ICCPCT)*, pp. 886-892. IEEE, 2023.
[16]. Ragavan, V. K., N. S. Nithya, Anantharamaiah Vengala, Balambigai Subramanian, and C. Ambhika. "Refractive Index Biosensor–Based Detection of Mycobacterium Tuberculosis Using Sea Lion Political Optimizer and Deep Learning." *Plasmonics* (2025): 1-19.
[17]. Toftum, Jørn. "Central automatic control or distributed occupant control for better indoor environment quality in the future." *Building and environment* 45, no. 1 (2010): 23-28.
[18]. Lee, Eunsil. "Indoor environmental quality (IEQ) of LEED-certified home: Importance-performance analysis (IPA)." *Building and Environment* 149 (2019): 571-581.
[19]. Kuntavai, T., and A. Jeevanandham. "RETRACTED ARTICLE: Adaptive wavelet ELM-fuzzy inference system-based soft computing model for power estimation in sustainable CMOS VLSI circuits." *Soft Computing* 24, no. 15 (2020): 11755-11768.
[20]. Kurni, Muralidhar, Ramesh Krishnamaneni, and Ashwin Narasimha Murthy. "Osprey–Lyrebird Optimization-Based Resource Allocation With Optimal Edge-Server Placement and Offloading in Mobile-Edge Server Computing." *International Journal of Communication Systems* 38, no. 13 (2025): e70214.
[21]. Karnekar, Kailash, Sachin Karad, and Vaibhav Ambavkar. "Data Leakage Detection for patient Database using RSA Algorithm.", International Conference on Recent Trends in Engineering & Technology (ICRTET'2014).
[22]. Qi, Meiwei, Xiaofeng Li, Enwei Zhu, and Yuchen Shi. "Evaluation of perceived indoor environmental quality of five-star hotels in China: An application of online review analysis." *Building and Environment* 111 (2017): 1-9.
[23]. Lai, A. C. K., Kwok Wai Mui, Ling Tim Wong, and L. Y. Law. "An evaluation model for indoor environmental quality (IEQ) acceptance in residential buildings." *Energy and buildings* 41, no. 9 (2009): 930-936.
[24]. Ren, Qiang, Zhiyong Zeng, Zhengwu Jiang, and Haoxin Li. "Functionalization of renewable bamboo charcoal to improve indoor environment quality in a sustainable way." *Journal of Cleaner Production* 246 (2020): 119028.
[25]. Pereira, Pedro F., Nuno MM Ramos, and António Ferreira. "Room-scale analysis of spatial and human factors affecting indoor environmental quality in Porto residential flats." *Building and environment* 186 (2020): 107376.
[26]. Tanasa, C., D. Dan, C. Becchio, S. P. Corgnati, and V. Stoian. "Cost-optimal and indoor environmental quality assessment for residential buildings towards EU long-term climate targets." *Energy for Sustainable Development* 59 (2020): 49-61.
[27]. Kumar, KRN Kiran, and K. Bhavani. "Folded spined cube: new topology in interconnection networks." In *2022 6th International Conference on Computing Methodologies and Communication (ICCMC)*, pp. 314-319. IEEE, 2022.
[28]. Kumar, T. Sathish, Pachaivannan Partheeban, S. Rajes Kannan, R. Ponnusamy, Ranganathn Ranihemamalini, and K. Deepa. "Finger vein based human identification and recognition using Gabor filter." In *2022 International Conference on Data Science, Agents & Artificial Intelligence (ICDSAAI)*, vol. 1, pp. 1-6. IEEE, 2022

[29]. Balakrishnan, S., P. Michael Preetam Raj, J. Somasekar, Kambala Vijaya Kumar, S. Amutha, and A. Sangeetha. "Remote sensing data-based satellite image analysis in water quality detection for public health data modelling." *Remote Sensing in Earth Systems Sciences* 7, no. 4 (2024): 532-541.

[30]. Krishnamaneni, R., A. N. Murthy, and S. Sen. "Quantitative analysis of disease dynamics in machine learning models for diabetes prediction." *International Journal of Computer Science and Engineering Research and Development (IJCSERD)* 12, no. 1 (2022): 10-20.

[31]. Mundhe, S. S., and S. C. Karad. "Soil Spectroscopy: Advance Soil Analysis Prediction Technology.", AgriCos e-Newsletter, 1(7), November 2020, 1-4.

[32]. Ramya Sharma, Chinnasami Sivaji, M. Ramachandran, Prabakaran Nanjundan, "An Analysis on Sustainable Automotive Car Body Material Using Weighted Sum method", REST Journal on Emerging trends in Modeling Manufacturing, 10(3) September 2024, 9-18.

[33]. Manikandan, G., and G. Bhuvaneswari. "Knowledge discovery in data of prostate cancer by applying ensemble learning." *Indian Journal of Computer Science and Engineering (IJCSE), e-ISSN* (2022): 0976-5166.

[34]. Kanaparthi, Priyanka, Janjhyam Venkata Naga Ramesh, U. Ganesh Naidu, VS Divya Sundar, and Anantharamaiah Vengala. "Prediction of Diabetes using Machine Learning Algorithms." In *2024 IEEE 3rd World Conference on Applied Intelligence and Computing (AIC)*, pp. 223-226. IEEE, 2024.

[35]. Chen, Xi, Hongxing Yang, and Ke Sun. "A holistic passive design approach to optimize indoor environmental quality of a typical residential building in Hong Kong." *Energy* 113 (2016): 267-281.

[36]. Ferdyn-Grygierek, Joanna. "Indoor environment quality in the museum building and its effect on heating and cooling demand." *Energy and Buildings* 85 (2014): 32-44.

[37]. Yang, Da, and Cheuk Ming Mak. "Relationships between indoor environmental quality and environmental factors in university classrooms." *Building and Environment* 186 (2020): 107331.

[38]. Habibi, Shahryar. "Smart innovation systems for indoor environmental quality (IEQ)." *Journal of building engineering* 8 (2016): 1-13.

[39]. Pei, Zufeng, Borong Lin, Yanchen Liu, and Yingxin Zhu. "Comparative study on the indoor environment quality of green office buildings in China with a long-term field measurement and investigation." *Building and Environment* 84 (2015): 80-88.

[40]. Amutha, S. "Onion Integrated aggregate node Behavior Analysis with onion Based Protocol." In *2020 6th International Conference on Advanced Computing and Communication Systems (ICACCS)*, pp. 1086-1088. IEEE, 2020.

[41]. Prasanth, A., B. Ragavi, S. Jayachitra, and T. Kuntavai. "Automated Detection of Oropharyngeal Carcinoma Using Super-Resolution Generative Adversarial Network and Convolutional Neural Network." In *2024 International Conference on Smart Electronics and Communication Systems (ISENSE)*, pp. 1-6. IEEE, 2024.

[42]. Murthy, Ashwin Narasimha, Souptik Sen, and Ramesh Krishnamaneni. "The role of supervised learning in enhancing diagnostic accuracy of neurodegenerative diseases." *International Journal of Advanced Research in Engineering and Technology (IJARET)* 11, no. 8 (2020): 1063-1076.

[43]. Vimala Saravanan, Chinnasami Sivaji, M. Ramachandran, Sathiyaraj Chinnasamy, "The Selection of Li-Ion Batteries Used in Electric Vehicles (EV)'s Using the TOPSIS Method", Journal on Applied and Chemical Physics, 3(3), September 2024, 11-21.

[44]. Kumar, VV Praveen, Vutukuri Sai Mounika, Bandaru Gayathri, Yelchuri Venkata Sudheshna, Kaki Sandhya, and Gogulapati Glory. "IOT ENABLED REAL-TIME DIGITAL CAMPUS NOTICE BOARD." *International Journal of Engineering Research and Science & Technology* 21, no. 2 (2025): 1307-1316.

[45]. Nematchoua, ModesteKameni, Paola Ricciardi, José A. Orosa, Somayeh Asadi, and Ruchi Choudhary. "Influence of indoor environmental quality on the self-estimated performance of office workers in the tropical wet and hot climate of Cameroon." *Journal of Building Engineering* 21 (2019): 141-148.

[46]. Mishra, Ankush Aniket, C. Madhurima, Sai MR Gautham, Jishin James, and D. Annapurna. "Environment descriptor for the visually impaired." In *2018 International Conference on Advances in Computing, Communications and Informatics (ICACCI)*, pp. 1720-1724. IEEE, 2018.

[47]. Jones, Christonson Berin, and Chakravarthi Murugamani. "Malaria parasite detection on microscopic blood smear images with integrated deep learning algorithms." *Int. Arab J. Inf. Technol.* 20, no. 2 (2023): 170-179.

[48]. Kumar, Bishwajeet, and A. Ranjith Kumar. "AEZ-SEP: Advance Extended Zonal Stable Protocol with Hierarchical Clustering Approach for WSN-Based IoT Networks." *SN Computer Science* 6, no. 6 (2025): 686.

[49]. Bogireddy, Srinivasa Rao, and Haritha Murari. "Comparing the Performance of Classification Algorithms in the Conservation of Plant Genetic Resources for Agriculture and Food Security." In *2024 IEEE International Conference on Agrosystem Engineering, Technology & Applications (AGRETA)*, pp. 116-122. IEEE, 2024.

[50]. Joel, M. Robinson, G. Manikandan, and G. Bhuvaneswari. "An analysis of security challenges in internet of things (iot) based smart homes." In *2023 Second International Conference on Electronics and Renewable Systems (ICEARS)*, pp. 490-497. IEEE, 2023.

[51]. Mohan, VakaMurali, MalliKarjuna Reddy, and KRN Kiron Kumar. "A New Approach to Optical Networks Security: Attack-Aware Routing and Wavelength Assignment." In *IJCA Special Issues on "2nd National Conference-Computing, Communication and Sensor Network" CCSN*. 2011.

[52]. Vuppala, Venkata Praveen Kumar, and Indraneel Sreeram. "Department of Computer Science and Engineering (CSE), St. Ann's College of Engineering and Technology, Chirala, India." *Asian Journal of Information Technology* 17, no. 2 (2018): 131-141.

[53]. Amutha, S., and A. Ramathilagam. "Improved IDS for Vehicular Ad-Hoc Network using Deep Learning Approaches." In *2023 2nd International Conference on Automation, Computing and Renewable Systems (ICACRS)*, pp. 341-346. IEEE, 2023.

[54]. Kuntavai, T., and A. Jeevanandham. "A Power Efficient Level Converter with Scalable Driving Capability Using Body Bias Techniques." *Journal of Computational and Theoretical Nanoscience* 15, no. 1 (2018): 237-244.

[55]. Krishnamaneni, Mr Ramesh, and A. N. Murthy. "Advancing Drug Dealing Detection Using Neural Embedding and Nearest Neighbour Searching Techniques." *International Journal on Recent and Innovation Trends in Computing and Communication* 9, no. 7 (2021): 19-23.

