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Exploring Household Wood Preferences among Consumers in Coimbatore

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aims: This study aims to comprehensively investigate and analyze the factors that shape consumer preferences for various types of wood in the context of household applications in Coimbatore. By delving into the intricate dynamics that guide wood selection for domestic purposes, the research seeks to identify the underlying drivers that influence consumer choices. Through a meticulous examination of factors such as material versatility, eco-friendliness, aesthetic appeal, and material uniqueness, the study aims to provide a nuanced understanding of the key determinants that significantly impact the preferences of consumers when it comes to selecting

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specific wood varieties for furniture, decor, and other household uses. By shedding light on these preferences, the research aims to contribute valuable insights that can aid businesses, manufacturers, and policymakers in tailoring their products and strategies to better align with the evolving demands and preferences of consumers in the Coimbatore region.
Study Design: Exploratory research design.
Place and Duration of Study: The present study was conducted in the year 2023 during June and July
Methodology: The data were collected from 120 consumers in Coimbatore city using snowball sampling and Convenience sampling will be used to select the respondents for the present study with the help of a well-structured interview schedule used to scale the factors. To analyze the data using factor analysis to identify the main factors that influence consumers' preference for wood such as availability, price, durability, appearance, eco-friendliness, and personal preference.
Results: Factors analysis provides that material excellence factors which comprise four factors versatile and modifiable, eco-friendly, aesthetic appeal, and uniqueness of material with a variance of 63.770 percent were the most influenced factors for preference for wood.
Conclusion: In conclusion, this study employed factor analysis to discern the key determinants shaping consumers' wood preferences. The analysis revealed that material excellence, encompassing factors related to versatility, eco-friendliness, aesthetic appeal, and material uniqueness, accounted for a significant variance of 63.770 percent in influencing wood preference. These findings emphasize the paramount importance of considering factors beyond traditional attributes like availability, price, and durability, and highlight the significance of holistic material qualities in shaping individuals' choices in wood selection.

Keywords: Wood; wood products; engineered wood; consumer preference; household application.

1. INTRODUCTION

Wood is regarded as a renewable resource. However, natural forest-based wood industries in many nations have been characterized by rapid rises in production, followed by a peak and a subsequent decrease. A review was done to see if there was any evidence of a global trend in the removal of wood from natural forests. This was accomplished using publicly available information on the production of wood worldwide from a variety of sources, including plantations, planted forests, and trees that are not part of forests. Around 1989, the world's supply of wood from natural forests reached a peak, and it has been declining ever since. The difference between the entire demand for roundwood and the natural forest supply has been filled by an increasing supply of cultivated trees [1].

Nowadays, natural wood is used less frequently than in the past to make household appliances, furniture, and decorative items. Binggeli [2] asserts. Wood byproducts are useful to humans for producing furniture, designing interior spaces, and decorative purposes. There are numerous categories of these byproducts. For instance, wood veneers are very thin slices of wood that are applied to the surface of furniture, decorative items, and wall paneling, whereas lumber is solid wood used for construction and framing. An uneven number of layers of wood products are sandwiched together to form plywood. Plywood, particleboard, MDF, hardboards, and oriented strand board (OSB) are examples of wood composite panels (composition boards). They offer broader flat surfaces and are constructed of layers of wood particles and glue.

Wood materials that people use in their houses as furniture, decorative objects, and various domestic appliances have benefits and detriments. According to Turkcu [3], lightness is the leading positive feature of wood. Wood materials that can be easily jointed can be interconnected, attached, and pieced with nails, screws, etc. It is a heat-insulating material. It can be easily processed. Also, it is a material that does not transmit electricity (non-conducting) when dry, while its conductivity increases when wet. It is a material with high bearing capacity. Water permeability is one of the undesired features of wood. If not protected, it absorbs water, whereas upon drying it shrinks, and it may crack when dry. Another negative feature of wood is that it tends to decay and rot. Woodworms, insects, fungi, and bacteria may cause wood decay. Lack of fire resistance is its most negative characteristic.

The products of primary mechanical processing of wood—are Roundwood products (e.g., poles

and pilings), sawn wood (primarily lumber), veneer, plywood and laminated wood, particleboard, fibreboard, and pulp and paper. It also discusses treatments (drying and preservation) that have been devised to improve the performance of wood in use and the chemical products that are derived or extracted from wood. Some products of primary manufacturers, such as poles and posts, are used directly, but many constitute intermediate materials that by further processing are turned into secondary products such as furniture, building structures and components, containers, and musical instruments.

The problem statement centers on the complexity of selecting appropriate wood types for diverse applications and their broader implications. The decision-making process involves intricate trade-offs between factors such as sustainability, aesthetic appeal, durability, and functionality. This necessitates a holistic understanding of consumer preferences, industry demands, and environmental considerations to strike a balance between effective wood selection and its wide-ranging applications. The performance of wood in practical applications and the extraction of chemical products from wood are integral to addressing the identified problem. Wood's mechanical properties, like strength and resistance to decay, directly affect its suitability for different uses. Concurrently, understanding the chemical components within wood enables the extraction of valuable compounds for various industries. This dual perspective ensures an informed approach to wood selection, considering both its functional use and the potential benefits of derived chemical products.

Pioneered measuring per capita wood consumption using surveys, databases, and household verification, revealing two main categories - construction and furniture. In Bangladesh [4]. Explored factors influencing brand preference for wooden furniture, offering insights for manufacturers. Dani (2006) identified seven elements shaping customer buying behavior [5]. Studied wood's impact on indoor spaces, emphasizing health benefits [6]. Focused on wood in sustainable construction, highlighting key factors for housing sustainability (Svajlenka and Kozlovska 2021). The study identifies consumer groups valuing wood's ecological benefits and aesthetic advantages for multi-story timber homes and sustainable development [7]. The study examines consumer perceptions of wood products, highlighting a preference for wood's natural appeal and favoring wood composite furniture for its usability and design options over costlier natural wood [8]. The study explores wood products' impact on multistory residential building sustainability, linking consumer perceptions to sustainable consumption consciousness and guiding industries toward meeting sustainability demands [9]. These studies collectively shed light on wood usage trends, consumer preferences, and its significance in various applications.

1.1 Theoretical Framework

Factor analysis is a statistical technique that focuses on the relationships between variables without categorizing them as 'dependent' or 'independent'. In this study, factor analysis served two main purposes: firstly, to condense the data while preserving its essential information, and secondly, to merge highly correlated variables into a single factor. As a result, the initial dataset was condensed into a smaller number of factors that were mostly independent or had minimal correlations among them. The technique helped to identify the underlying dimensions that grouped variables into factors [10-12].

Table 1. Production and Trade – Export & Import

	Production Quantity (x 1000 m3)	Import Quantity (x 1000 m3)	Export Quantity (x 1000 m3)
Ind. Roundwood	48154	4923	5.6
Sawnwood	23975	1715.14	4.78
Veneer	291.03	390.14	53.21
Plywood	10060	174.67	151.47

ITTO (2022)

Factor analysis Model

$Xi = A_{ij}F_1 + A_i2F_2 + Ai_3F_3 + \text{----------} + A_{im}F_m + V_iU_i$

Where,

X_i = i th standardized variable
A_{ij}= standardized multiple regression coefficient of the variable on common factor j
F= common factor
V_1= standardized multiple regression coefficients of the variable on unique factor i
U_i= Unique factor for variable i
m = number of common factors
The unique factors are uncorrelated with each other and with common factors. The common factors themselves can be a linear combination of the observed variables.

$Fi = W_{i1}X_1 + W_{i2}X_2 + W_{i3}X_3 + \text{----------} + W_{ik}X_k$

Where,

F_i = estimate of the factor
W_i = weight or factor score coefficient
K = several variables.

It is possible to select weights or factor score coefficients so that the first factor explains the largest portion of the total variance. Then a second set of weights can be selected so that the second factor accounted for most of the residual variance subject to being uncorrelated with the first factor.

2. METHODOLOGY

The choice of conducting the study in Coimbatore, Tamil Nadu, aligns with the problem statement due to its significance as a growing urban center with diverse wood-related applications. Coimbatore's demographic and economic characteristics influence consumer preferences for wood types in household and industrial contexts. Statistical data showcasing the city's prominence in furniture production and trade, coupled with its ecological concerns, support the decision to study this specific region. The data collection methods, including snowball sampling and structured questionnaires, are justified through a thorough literature review. Similar studies utilizing snowball sampling in urban settings have yielded insights into consumer behavior. Literature on questionnaire-based surveys in the context of consumer preferences and market analysis establishes their effectiveness in gathering relevant data. This methodological choice draws from the established practices in the field, ensuring a comprehensive evaluation of wood selection preferences in Coimbatore [13-15].

The method framework developed for this study involves several stages. Firstly, literature review and preliminary data analysis establish the context and identify relevant variables. Secondly, data collection through structured questionnaires is employed to gather consumer and industry perspectives. The collected data undergoes thorough cleaning and preprocessing. Subsequently, factor analysis is applied to unveil latent variables influencing wood preferences. The resulting factors are then interpreted in the context of the problem statement. This methodological approach ensures a systematic exploration of consumer preferences and their underlying drivers, ultimately contributing to a comprehensive understanding of wood selection in household applications in Coimbatore.

3. RESULTS AND DISCUSSION

3.1 Factors Influencing Consumer Preferences

3.1.1 Result of KMO & Bartlett's Test

From this Table 2, it has been found that the approx. The chi-square value is 938.549 with 78 degrees of freedom which is significant at 0.05 level. Besides, a high value (between 0.5 and 1.0) of the KMO measure of sampling adequacy indicates that the factor analysis is appropriate. Here, as the value of the KMO statistic (Table 2) is .604, the factor analysis has been considered an approximate technique for analyzing the data. It could be concluded that the results of KMO & Bartlett's test proved the sampling adequacy of the data to run the factor analysis

3.1.2 Total variance

In Table 4, the eigenvalues for a factor indicate the total variance attributed to that factor. The total variance accounted for by all thirteen variables is 13, which is equal to the number of variables. Factor 1 accounts for a variance of 3.136, which is 24.125 percent of the total variance. Likewise, the next 4 factors account for 15.731 percent, 13.998 percent, 9.916 percent, and 8.351 percent of the total variance respectively. Here, the first five (05) factors combined account for 72.121 percent of the total variance. The 'Extraction Sums of Square Loadings' shows the variances associated with the factors that are retained. These are the same as under 'Initial Eigenvalues'.

Table 2. KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.604
Bartlett's Test of Sphericity	Approx. Chi-Square	938.549
	df	78
	Sig.	0.000

Table 3. Total variance explained

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.136	24.125	24.125	3.136	24.125	24.125
2	2.045	15.731	39.856	2.045	15.731	39.856
3	1.820	13.998	53.854	1.820	13.998	53.854
4	1.289	9.916	63.770	1.289	9.916	63.770
5	1.086	8.351	72.121	1.086	8.351	72.121
6	0.950	7.311	79.432			
7	0.616	4.736	84.168			
8	0.591	4.543	88.711			
9	0.500	3.844	92.555			
10	0.402	3.091	95.646			
11	0.321	2.470	98.116			
12	0.227	1.747	99.864			
13	0.018	0.136	100.000			
Extraction Method: Principal Component Analysis.						

3.1.3 Scree plot

The number of factors has been determined based on several considerations: (i) eigenvalues (only five factors with eigenvalues greater than 1.0 are retained [Table 4]); (ii) screen plot (the plot [Fig. 1] has broken at 5 factors between the steep slope of factors, with large eigenvalues and gradual trailing off (scree) associated with the rest of the factors); (iii) a percentage of variance the factors extracted should account for least 60 percent of the variance and here, the first five (05) factors account for 72.121 percent of the total variance [Table 2].

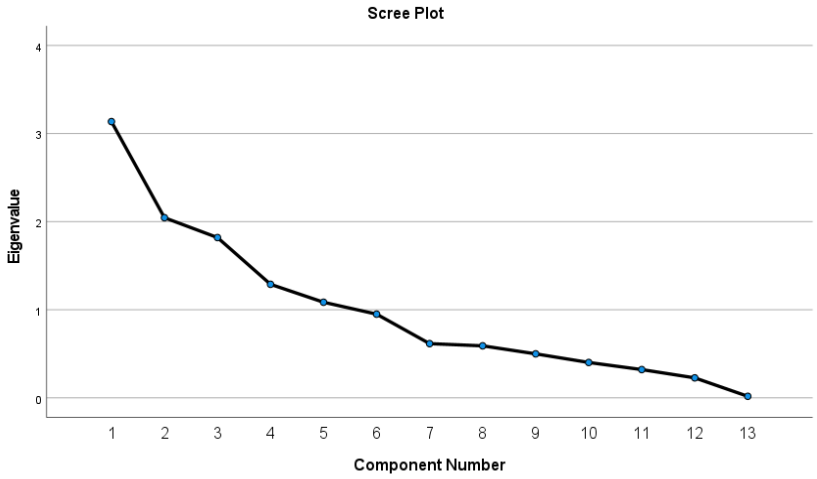

Fig. 1. Scree plot

3.1.4 Rotated component matrix

Table 4. Rotated component matrix

Rotated Component Matrixa					
	Component				
	1	**2**	**3**	**4**	**5**
Versatile and modifiable	**0.930**				
Ecofriendly	**0.926**				
Aesthetic appeal	**0.782**		-0.239		0.123
Uniqueness of material	**0.671**	0.391			0.241
Thermal and sound insulation		**0.818**			-0.165
Building comfort		**0.787**			
Fire resistance		**0.673**	-0.307	-0.139	0.210
Weather resistance	-0.116		**0.898**		
Ease of handling			**0.857**	-0.106	
Health and Safety	-0.155		-0.197	**0.855**	
Durability to withstand damage	0.368	-0.147		**0.775**	
Reasonable price	0.174	-0.126		-0.114	**0.808**
Easy maintenance and cleaning	-0.134	0.149	0.283	0.160	**0.561**
Extraction Method: Principal Component Analysis.					
Rotation Method: Varimax with Kaiser Normalization.					

3.1.5 Component and factors

It could be inferred from Table 5 that four component was named Material Excellence Factors which comprise four factors Versatile and modifiable, Ecofriendly, Aesthetic appeal, Uniqueness of material List with a variance of 63.770 percent, and the second component named Building Performance Enhancements which includes three factors such, Thermal and sound insulation, Building comfort, Fire resistance with a variance of 20.398 percent. The third component was named Practical Performance Features which includes two factors Weather resistance and ease of handling with a variance of 8.387 percent. The fourth component was named Protection and Longevity Aspects which includes two factors Health and Safety, factor. Durability to withstand damage, with a variance of 5.562 percent. The fifth component was named Economic Viability and Maintenance which includes two factors Reasonable price and Easy maintenance and cleaning with a variance of 1.883 percent.

It could be evident from the factor analysis that Material Excellence Factors with a variance of 63.770 percent were the most influenced factors in the preference for various types of wood in the household application. The factors namely versatile and modifiable, eco-friendly, aesthetic appeal, and uniqueness of material were loaded under component 1 and the same referred to as material excellence factors.

Table 5. Component and factors

Component	**Variance %**	**Factors**
Material Excellence Factors	63.770	Versatile and modifiable Ecofriendly Aesthetic appeal Uniqueness of material
Building Performance Enhancements	20.398	Thermal and sound insulation Building comfort Fire resistance
Practical Performance Features	8.387	Weather resistance Ease of handling
Protection and Longevity Aspects	5.561	Health and Safety Durability to withstand damage
Economic Viability and Maintenance	1.883	Reasonable price Easy maintenance and cleaning

The research findings hold significant value as they offer a comprehensive analysis of the factors influencing consumer preferences in wood selection. Through methods such as KMO & Bartlett's Test, eigenvalue assessment, scree plot analysis, and rotated component matrix examination, the study systematically uncovers the underlying dimensions driving consumer choices. This structured approach ensures the reliability of the findings. The derived components, like "Material Excellence Factors," carry practical insights that can guide industries in tailoring wood offerings to align with these preferences, ultimately enhancing customer satisfaction and sustainable resource utilization.

The choice of various wood types for wood selection and its broader applications is substantiated by a rigorous analysis rooted in the problem statement. Through a detailed exploration of factors, such as material versatility, eco-friendliness, aesthetic appeal, and uniqueness, the study addresses the complexities surrounding wood selection. By employing statistical tools like factor analysis, the research provides empirical evidence that Material Excellence Factors significantly influence preferences. This justification underscores the practical relevance of this study, offering guidance to the wood industry in Coimbatore and beyond on how to strategically align their product offerings with consumer demands and broader application needs.

4. CONCLUSION

The research findings stand as a robust validation of the problem statement. Through meticulous analysis, it's evident that Material Excellence Factors, including versatility, eco-friendliness, aesthetic appeal, and material uniqueness, significantly influence consumer preferences for wood types in household applications. The KMO & Bartlett's Test substantiates the suitability of the data for factor analysis. The eigenvalues, scree plots, and rotated component matrices reveal a structured hierarchy of factors that guide wood selection, aligning seamlessly with the research's purpose. In conclusion, this study effectively addresses the problem of selecting various wood types for different applications. The research demonstrates that Material Excellence Factors dominate consumer preferences for wood in household applications. By leveraging statistical methods and factor analysis, the findings underscore the importance of tailoring wood offerings to meet the demands of versatility, eco-friendliness, aesthetic appeal, and material uniqueness. These insights hold significant implications for industries and policymakers striving to align wood selection with evolving consumer preferences and broader application needs.

The literature outcomes corroborate the significance of this study's findings. Prior research suggests that consumer preferences are complex, and driven by multifaceted factors like sustainability, functionality, and aesthetics. This study's outcomes validate these theories by revealing that Material Excellence Factors heavily impact consumer choices, substantiated by empirical data. The alignment between literature and findings reaffirms the importance of understanding these drivers to guide wood selection in line with consumer demands and broader industrial applications. The choice of various wood types for wood selection and its broader applications is profoundly informed by the gaps addressed in the literature and this study's findings. Literature indicates that understanding consumer preferences is critical, and this research bridges this gap by systematically unveiling the dominant factors driving these preferences. By addressing these gaps, this study provides a nuanced understanding of how factors like versatility, eco-friendliness, aesthetics, and uniqueness guide wood selection. This aligns with industry needs, where informed wood selection is crucial for meeting consumer demands and achieving sustainable, practical, and aesthetically pleasing applications.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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