

Study on Consumer Buying Behavior of Ceramic Tiles using Multi-Criteria Decision Making

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Abstract:

The main purpose of this research work is to explore the consumer priorities, preference of consumers on buying Ceramic Tiles. The study will also focus on understanding the key factors which triggers the consumers purchasing decision of ceramic tiles. A detailed study has been planned to identify the different criteria which will be the deciding factors of selecting ceramic tiles from a particular brand. Comparison has been made by considering some leading brands available in Indian market in the ceramic manufacturing and business. Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) as a multi criteria decision making (MCDM) tools has been used to accomplish the research objectives.

Keywords: *TOPSIS, Multi Criteria Decision Making, Ceramic Tiles, Purchasing decision*

Introduction

India is one of the fastest-growing ceramic tile marketplaces at the global level. Some of the major factors augmenting the growth of the ceramic tiles demand in India are the growing real estate sector coupled with government policies fueling strong growth in the housing sector. In addition, rising disposable income in India and a corresponding desire for beautification of living and working spaces are also driving the need for ceramic tiles in the country. The government schemes such as ‘Pradhan Mantri Awas Yojana’, building up of toilets in ‘Swachh Bharat Mission’, Cluster development Program, Credit linked subsidy scheme for infrastructural development and ‘Smart Cities, are likely to provide a further impetus to the real estate market vis a vis ceramic tiles industry in India. The market size was valued at 3720.2 million and forecasted to be valued at 7144.7 million by 2027, rising at a compounded growth rate of 8.6 % from 2020 to 2027(Indian ceramic Tiles Market, 2022). Globally India has obtained the second position after China among the top manufacturer of Ceramic tiles and produced 8.2% of the total world production (ICCTAS, 2020). India ranks in the list of top three major exporter country and exported 15.8% of total world exports.

Various types of segmentation based on types, end user, application etc. exists in the ceramic tile market. For example, broadly types are ceramic, vitrified, porcelain, glazed etc., applications are floor tiles and wall tiles, end user applies to residential and non-residential and so on. The ceramic tile industry is characterized by concentrated industry with having significant market share in the hands of a few major players named as Asian Granito India Limited, Kajaria Ceramics Limited, Nitco

Limited, Orient Bell Limited, RAK Ceramics, Somany Ceramics Limited, H & R Johnson (India) Limited (Prism Johnson) etc (Mordor Intelligence, 2020).

This research paper has aimed to focus on consumer purchasing decision influenced by the different criteria of selecting ceramic tiles with the alternatives or the brands available in the market. It seems that the decision making with a crisp intention of purchasing any product has no complications but the availability of numerous factors with numerous alternatives sometimes making it difficult for the consumer to attain a robust decision. It becomes more complicated when some qualitative judgements are involved in the decision-making process. The use of multicriteria/multi attribute decision making model may add value to increase the preciseness of approximation of decision-making process. Whenever there is a role of consumer perception selecting the best criteria among multiple criteria there lies individual differences. MCDM/MADM can be considered as one of the fruitful and scientific applications in solving critical decision-making issues. In this study MADM has been applied to analyze consumer buying decision making process while purchasing ceramic tiles. Purchase decision consists of consumer action and response to buy a product (Pickett-Baker & Ozaki, 2008). Purchasing decision is important because it leads to satisfaction or dissatisfaction of the consumers based on their need, desire and expectations (Olshavsky & Granbois, 1979; Puccinelli et al., 2009). The buying decision basically comprises of evaluating two or more alternatives and finally attain the process of decision making (Schiffman & Kanuk, 2004). Buying decision process is the stages evolved for shaping the choices of a particular product (Levy & Lee, 2004; Kohli, Devaraj, & Mahmood, 2004; Johansson & Burt, 2004). Technique for order preference by similarity to ideal solution has been considered appropriate here to apply in analyzing this consumer buying decision process for ceramic tiles. TOPSIS under MCDM/MADM area has many-sided application like manufacturing decision making process, financial performance analysis (Bulgurcu B (Kiran), 2012), Mukherjee & Nath, 2005), educational selection applications (Nanayakkara C., 2019). Application of TOPSIS Technique for Financial Performance Evaluation of Technology Firms in Istanbul Stock Exchange (Bulgurcu, 2012), because of its robust mathematical base, easy application methodology and simplicity (Yeh, 2002). This method is popular because it is able to select the best alternative from a number of alternatives based on the specific criteria or attributes (Ho & Dey, 2010). The paper has been organized in the following. In section 2 the research methodology including data collection methods has been discussed. Section 3 elaborates the analysis and findings and finally the last section concludes.

Research Methodology

For accomplishing the research objective, two multi criteria decision making has been used. TOPSIS as a method of multicriteria decision making has been used here. It is adopted for the purpose of ranking of ceramic tiles from different manufacturers under consideration. The price band has been considered as Rs 1100 to Rs. 1500. Here the Criteria price is based on a particular tiles size that 24X24 Vitrified Floor Tiles that each brand is charging per box. Based on this price band and suggested by the consumer survey the top five market players has been selected. These are Kajaria Ceramics, RAK Ceramics, HR Johnson NITCO, AGL.

The aim of the study is to analyze the purchase intention of the consumer in the ceramic tile segment. The location for this study has been chosen as Kolkata metropolitan area. The time frame of the study is the year 2022. Primary data has been collected by using structured questionnaire circulated online

through google forms and offline by surveying walk-in potential customer in different showrooms of ceramic tiles in Kolkata Metropolitan area.

These criteria have been selected based on offline survey conducted to the walk-in potential customers. Total 150 samples have been collected through offline and nearly 100 has been collected by distributing google forms online.

For the analysis part multi-criteria/attribute decision making methodology has been adopted. Under the MCDM/MADM domain the most applied method TOPSIS has been selected to accomplish the analysis part. TOPSIS is based on the underlying concept that the best alternative should have the shortest distance from the positive ideal solution (PIS) and the longest distance from the negative ideal solution (NIS). A ranking has been formed considering of an overall index, the calculation of which has been done according to the distances from the ideal solutions (Zeleny,2012, Hwang,&Yoon,1981,1995,Lai,Liu, Hwang,1994).

The steps in calculating the TOPSIS method (Yeh, 2002)

Step 1: Create an evaluation matrix with m alternatives and n criteria with the intersection of criteria and the matrix formed as x_{ij} and therefore have a matrix $(x_{ij})_{m \times n}$.

Step 2

The matrix $(x_{ij})_{m \times n}$ is then normalized to form the normalized matrix

$$\bar{X}_{ij} = \frac{X_{ij}}{\sqrt{\sum_{i=1}^n X_{ij}^2}}$$

Step 3: Computation of weighted matrix using the equation With the weight $W_j = (W_1, W_2, W_3, \dots, W_n)$, where w_j is the weight of the criteria for all j and $\sum_{j=1}^n w_j = 1$. The study has considered equal weight distribution for each criteria.

$$V_{ij} = \bar{X}_{ij} \times W_j$$

Step 4: Determining the ideal solution matrix of positive and negative ideal solution by using this formula: $A^+ = \{(\max v_{ij} | j \in J), (\min v_{ij} | j \in J'), i = 1, 2, 3, \dots, m\} = \{V_1^+, V_2^+, V_3^+, \dots, V_n^+\}$
 $A^- = \{(\min v_{ij} | j \in J), (\max v_{ij} | j \in J'), i = 1, 2, 3, \dots, m\} = \{V_1^-, V_2^-, V_3^-, \dots, V_n^-\}$

Calculate the Euclidian distance from Ideal Best

$$S_i^+ = \left[\sum_{j=1}^m (V_{ij} - V_j^+)^2 \right]^{0.5}$$

Calculate the Euclidean distance from ideal worst

$$S_i^- = \left[\sum_{j=1}^m (V_{ij} - V_j^-)^2 \right]^{0.5}$$

Step 5: Performance Score

$$P_i = \frac{S_i^-}{S_i^+ + S_i^-}$$

In this study to analyze the consumer purchase decision influenced by different criteria and alternatives in the ceramic tile segment. TOPSIS methods under MCDM/MADM domain has been used here. The key criteria and Alternatives are following

Criteria TOPSIS	Objective function Attribute & Cost
-----------------	-------------------------------------

- | | | |
|-----------|-----------------------------|-------------------------|
| C1 | Prices | Minimization (C) |
| C2 | Availability | Maximization(A) |
| C3 | Durability | Maximisation(A) |
| C4 | Aesthetic Features | Maximisation(A) |
| C5 | Consumer Preferences | Maximisation(A) |

The Alternatives are the top manufacturer of vitrified file based on specific price band.

Results & Findings

After selecting the criteria and alternatives and assigning the equal weights for each criteria the weighted Normalized Matrix has been presented in Table 1. Following proceeding steps mentioned in TOPSIS calculation based on positive ideal solution and negative ideal solution the performance ranking has been executed which has been shown in Table 2. The whole calculation has been done in Microsoft EXCEL.

Table 1: Weighted Normalized Matrix

	Price	Availability	Durability	Aesthetic Features	Consumer Preferences
Kajaria	98.5	0.38	0.35	0.52	5.17
HR Johnson	82.8	0.60	0.35	0.34	3.77
RAK	153.9	0.10	0.55	0.52	3.99
NITCO	115.6	0.38	0.20	0.34	0.08
AGL	134.1	0.22	0.35	0.19	0.00
Ideal Best	82.8	0.60	0.55	0.52	5.17
Ideal Worst	153.9	0.10	0.20	0.19	0.00

Table 2

Performance Score Results					
Alternatives Brands		Si*+	Si*-	Pi*	Rank
A1	Kajaria	15.73	55.65	0.78	1
A2	HR Johnson	1.43	71.24	0.50	3
A3	RAK	71.15	4.01	0.05	5
A4	NITCO	33.23	38.30	0.54	2
A5	AGL	51.56	19.84	0.28	4

The Table 2 is showing that Kajaria is ranked as 1, NITCO comes at 2nd Position, HR Johnson at 3rd 3, AGL is ranked as 4th and the 5th position is obtained by RAK ceramics. This ranking has been calculated taken into account the Euclidean distance from the ideal best (Si*+) and Euclidean distance from the ideal worst (Si*-) respectively and Pi is the Performance score obtained for each Alternatives based on the criteria.

Conclusion:

The study has made an attempt to suggest customer purchase intention towards purchasing ceramic tiles from five leading brands in India. The criteria has been chosen as Price, Availability, Durability, aesthetic Features and consumer Preferences. Subjective judgement of customers has been considered in selection of criteria for this study. Application of TOPSIS methodology is appropriate under the framework of Multi-Criteria/Attribute Decision Making environment. The aim of this study was to assess the determinant Factors of purchasing decision that could influence consumers purchasing decision of ceramic tiles. For that purpose five leading manufacturer of ceramic tiles have been considered and ranking has been made with TOPSIS application to better understand and suggest the consumer that which ceramic tile brands are most preferred. It has been found that Kajaria Tiles is the top ranked output from TOPSIS. This research work could be used as a pathfinder for ceramic tile manufacturer if more objective criteria have been incorporated with addition of more leading alternatives.

References:

1. Bulgurcu, B. K. (2012). Application of TOPSIS technique for financial performance evaluation of technology firms in Istanbul stock exchange market. *Procedia-Social and Behavioral Sciences*, 62, 1033-1040.
2. Chakraborty, S. (2022). TOPSIS and Modified TOPSIS: A comparative analysis. *Decision Analytics Journal*, 2, 100021.
3. Hwang, C. L., & Yoon, K. (1981). Methods for multiple attribute decision making. *Multiple attribute decision making: methods and applications a state-of-the-art survey*, 58-191.

4. (n.d.). India Ceramic Tiles Market. Alliedmarketresearch.com. Retrieved May 9, 2023, from <https://www.alliedmarketresearch.com/india-ceramic-tiles-market-A06525>
5. (n.d.). Indian Ceramic Tiles Industry. ICCTAS. Retrieved April 12, 2023, from <https://www.icctas.com/ceramicindustry.htm>
6. (n.d.). Indian Ceramic Tiles market. Mordor intelligence. Retrieved April 12, 2023, from <https://www.mordorintelligence.com/industry-reports/india-ceramic-tiles-market>
7. Johansson, U., & Burt, S. (2004). The buying of private brands and manufacturer brands in grocery retailing: a comparative study of buying processes in the UK, Sweden and Italy. *Journal of Marketing Management*, 20(7-8), 799-824.
8. Kohli, R., Devaraj, S., & Mahmood, M. A. (2004). Understanding determinants of online consumer satisfaction: A decision process perspective. *Journal of Management Information Systems*, 21(1), 115-136.
9. Lai, Y. J., Liu, T. Y., & Hwang, C. L. (1994). TOPSIS for MODM. *European journal of operational research*, 76(3), 486-500.
10. Levy, D. S., & Lee, C. K. C. (2004). The influence of family members on housing purchase decisions. *Journal of Property Investment & Finance*.
11. Mukherjee, A., & Nath, P. (2005). An empirical assessment of comparative approaches to service quality measurement. *Journal of services marketing*.
12. Nanayakkara, C., Yeoh, W., Lee, A., & Moayedikia, A. (2020). Deciding discipline, course and university through TOPSIS. *Studies in Higher Education*, 45(12), 2497-2512.
13. Olshavsky, R. W., & Granbois, D. H. (1979). Consumer decision making—fact or fiction?. *Journal of consumer research*, 6(2), 93-100.
14. Pickett-Baker, J., & Ozaki, R. (2008). Pro-environmental products: marketing influence on consumer purchase decision. *Journal of consumer marketing*, 25(5), 281-293.
15. Puccinelli, N. M., Goodstein, R. C., Grewal, D., Price, R., Raghubir, P., & Stewart, D. (2009). Customer experience management in retailing: understanding the buying process. *Journal of retailing*, 85(1), 15-30.
16. Rahim, R., Supiyandi, S., Siahaan, A. P. U., Listyorini, T., Utomo, A. P., Triyanto, W. A., ... & Khairunnisa, K. (2018, June). TOPSIS method application for decision support system in internal control for selecting best employees. In *Journal of Physics: Conference Series* (Vol. 1028, p. 012052). IOP Publishing.
17. Schiffman, L. Kanuk.(2004). *Consumer behavior*.
18. Yeh, C. H. (2002). A problem-based selection of multi-attribute decision-making methods. *International Transactions in Operational Research*, 9(2), 169-181.
19. Yoon, K. P., & Hwang, C. L. (1995). *Multiple attribute decision making: an introduction*. Sage publications.
20. Zeleny, M. (Ed.). (2012). *Multiple criteria decision-making Kyoto 1975* (Vol. 123). Springer Science & Business Media.