

An Integrated Kano–Theory and Cognitive Capital Framework for Modeling Consumer Satisfaction in Electronic Home Appliances: Unraveling Functional Performance, Awareness, and Socioeconomic Drivers

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Abstract:

Electronic home appliances (EHA) have become an important part of daily life, the causes of satisfaction with these products are scattered in different areas of literature, which studied the product attributes, the consumer knowledge and the demographic context separately. This study proposes and empirically tests an integrated model of Kano–cognitive capital that incorporates five product-attribute dimensions of Kano model (Must-Be, Performance, Delighter, Indifferent, and Reverse Features) with cognitive capital (customer awareness and customer education) and socioeconomic factors to model customer satisfaction with EHA in Indore City, India. The study used a structured questionnaire with 500 respondents, after data screening which resulted in 452 valid responses (381 had reliably linked appliance level satisfaction data), and Overall Product Satisfaction was measured at a respondent level (computing the satisfaction score over all appliances owned by the individual respondent), instead of one Kano sub-scale being used as a proxy measurement. Four hypotheses were tested using the Pearson correlation, independent-samples t-tests, and one-way ANOVA and multiple regression. The five Kano Model dimensions were all strongly correlated with satisfaction, with the highest being $r = .632$ for Performance Features, which was the only statistically significant unique predictor ($\beta = .432$) in the multivariate model ($R^2 = .416$). Satisfaction was found to be significantly related to customer education ($r = .357$), but not to customer awareness ($r = .029$), which is an experiential understanding of the product. The level of satisfaction was significantly different across gender, age and educational qualifications, but not across income level of the household. The results confirm the importance for both the appliance manufacturers and the retailers to account for both functional performance and consumer education efforts in the same explanatory framework to optimise satisfaction levels in the emerging urban Indian market.

Keywords: Kano Model; Cognitive Capital; Customer Satisfaction; Electronic Home Appliances; Customer Awareness; Customer Education; Consumer Behaviour; Emerging Markets

Introduction

The use of electronic home appliances (EHA) has shifted from the category of optional items to the essentials of everyday home functioning and changed the way households use time, energy and comfort. From refrigerators to washing machines, air conditioners to all kinds of small and large appliances, daily life in households is now being mediated by refrigerators. Nowadays, the routine functioning of households is mediated by refrigerators in both developed and emergent economies. With increasing number of appliances in possession and variety of product categories, the determinants of customer satisfaction with appliances have emerged as a focal issue for policy makers, retailers and manufacturers (Vijayalakshmi, 2018). This is even more pronounced in the fast-growing Tier-II cities of India like Indore, where growing disposable income, growing retail infrastructure and variety of products have made brands of appliances compete with each other and consumers now have higher expectations of the product's functionality, reliability and after-sales service (Bhatia, 2024; Sahoo, 2022).

Customer satisfaction is not a one-dimensional phenomenon in the case of home appliances. It is influenced at the same time by the functional use of the product, the user's former knowledge and awareness of the product, and the general socioeconomic context that shapes the expectations and uses of the product. Past satisfaction-related

research in this area has typically focused on the factors that influence the adoption of an appliance or the factors that influence the end user, such as the effect of marketing and advertisement on the purchase of an appliance (Kewat et al., 2023), the influence of consumer patterns on the appliance (S. et al., 2013), and the effect of demand side economic factors on the appliance (Tawari, 2024) have investigated these factors separately, following distinct theoretical lines. Few studies have tried to combine the product attribute level satisfaction theory with the cognitive and socioeconomic resources consumers bring to the purchase and use of the product. This disintegration reduces the applicability of current results to appliance manufacturers who want to put limited product development resources into different markets that have different types of consumers.

One of the more prominent lenses on product-attribute-level satisfaction is the Kano Model which was developed initially to categorize product and service attributes based on their non-linear relationship with customer satisfaction (Rotar & Kozar, 2017). According to Hassan et al., 2017, the model differentiates Must-Be attributes, which pose dissatisfaction if not present, but do not necessarily add satisfaction if present, from Performance (or one-dimensional) attribute, which has a linear relationship between dissatisfaction and satisfaction, and Attractive (or delighter) attribute, which has a linear relationship between satisfaction and presence, but no relationship between dissatisfaction and absence. Also, the model acknowledges Indifferent attributes for which the consumers are not very responsive, and Reverse attributes which if present can actually decrease the satisfaction of some consumers. This has been particularly applied in product design and service settings such as smart home energy-feedback products (Berger et al., 2022), multifunctional kitchen cookers (Karabacak, 2025), and air purifiers (Wu, 2021), which shows that not all product attributes add to the overall satisfaction, and some of them even detract from it. For the appliance industry in particular, Kano based investigations showed that the satisfaction dimensions of the sales environment, price, user features, design, and technical features are key factors in appliances, where the failure to meet basic Must Be requirements like safety and basic functionality leads to high levels of dissatisfaction (Rotar & Kozar, 2017).

The Kano Model provides a good understanding of the way product features are related to satisfaction, but in its original version does not take into account the cognitive resources consumers bring when evaluating a product. Enter the concept of cognitive capital. Based on the social capital theory, cognitive capital is defined as the shared ideas, knowledge frameworks, and interpretive resources that assist people to make sense of information (Birasnav et al., 2019; Chang & Hsu, 2016). So far, cognitive capital has been studied in the contexts of organisations (e.g. emotional and cognitive capital as a source of value creation in the digital economy, Luo, 2025) or platforms (e.g. knowledge about product usage of a consumer, Luo, 2025). However, cognitive capital also naturally can be applied to the context of consumer behaviour: When a consumer learns about features, energy-efficiency ratings, and warranties of appliances, this represents a certain form of cognitive capital that may plausibly influence his or her evaluation of the appliance. Although awareness and education have received their own attention in much of the existing consumer-behaviour literature, they might better be considered to be complementary as they both build the ability for consumers to obtain the correct perception and appreciation of product performance (Chang et al., 2018).

The other layer of influence on appliance satisfaction, namely socioeconomic and demographic characteristics, has been treated somewhat superficially in the literature. Income, education, and age are well established correlates of purchase intention and satisfaction with the purchase of energy-efficient appliances (Al Kurdi et al., 2025; Harun et al., 2022). In the same way, studies conducted in Indian urban settings have suggested different demographic groups' preferences for and satisfaction with brands of household durables (Bhatia, 2024). Yet, the socioeconomic factors are rarely analyzed together with the product-attribute level Kano dimensions and the constructs of cognitive capital in the same analytical framework, and it remains unknown what explanatory power they add to each other.

To fill this gap, the present study proposes an integrated framework in which the consumer awareness and education are considered as cognitive-capital and the Kano Model attribute theory. In particular, this study analyzes the relationship of Must-Be, Performance, Delighter, Indifferent, and Reverse product attributes with the overall satisfaction of the consumers towards electronic home appliances, taking into account the independent and joint effect of customer awareness, customer education, and key demographics (age, gender, income, and

educational qualification). The study addresses calls in the wider consumer satisfaction research for more integrative and multi-theoretic approaches that transcend single-construct explanations, which was also noted in other consumer-related fields – knowledge and information search has been found to have a joint effect on purchase intention and satisfaction with products, along with other factors (Reddy and Thanigan, 2023); online information sources affect purchase intention for energy-saving products in particular (Yang et al., 2024).

Theoretically and practically the integration is important for a number of reasons. First, functional performance attributes continue to be important in appliance satisfaction, but the impact of these performance attributes cannot be captured without drawing on the cognitive resources consumers rely on to make sense of product performance (He et al., 2023). Second, the expansion of the features on appliances—such as smart connectivity, energy-saving modes, and app controls—has made awareness and education more important moderators of satisfaction, rather than ancillary considerations (Azzola et al., 2026). Third, in developing markets like India, which are rapidly expanding and diversifying, the understanding of interaction of socioeconomic stratification with product-attribute perception helps manufacturers and policy makers in the segmentation of markets and designing consumer protection policies than attribute analysis alone (Jasrai & Kaur, 2025).

Objectives of the Study

Building on this rationale, the study pursues five specific objectives:

Objective 1: To identify and analyse the Kano Model attributes (Must-Be, Performance, Delighter, Indifferent, and Reverse features) that influence customer satisfaction with electronic home appliances.

Objective 2: To compare satisfaction levels among electronic home appliance users in Indore City across key demographic attributes (age, gender, educational qualification, and monthly household income).

Objective 3: To examine the relationship between customer awareness and satisfaction with electronic home appliances.

Objective 4: To investigate the role of customer education in shaping satisfaction with electronic home appliances.

Objective 5: To develop an integrated model of customer satisfaction with electronic home appliances that combines Kano Model attributes, cognitive-capital constructs (awareness and education), and demographic context.

Objectives 1, 3, and 4 are addressed through Hypotheses H01, H03, and H04 respectively, Objective 2 is addressed through Hypothesis H02, and Objective 5 is addressed through the integrated regression-based model presented in the Results section (Table 9; Figure 7).

The remainder of this paper is organised as follows. The following section gives a more detailed review of the theoretical bases of the Kano Model and the cognitive capital theory and formulates the hypotheses of this study. This is followed by description of the methodology of the research, its sampling and measurement instruments to operationalise the constructs of Kano dimensions, awareness, education and satisfaction. The results section then provides empirical results of the main survey carried out with the users of electronic home appliances of Indore City and thereafter has discussed the theoretical and managerial significance of the results. The paper ends by discussing the limitations of the study and further research on the integrated models for consumer satisfaction in the electronic home appliance industry.

Methodology

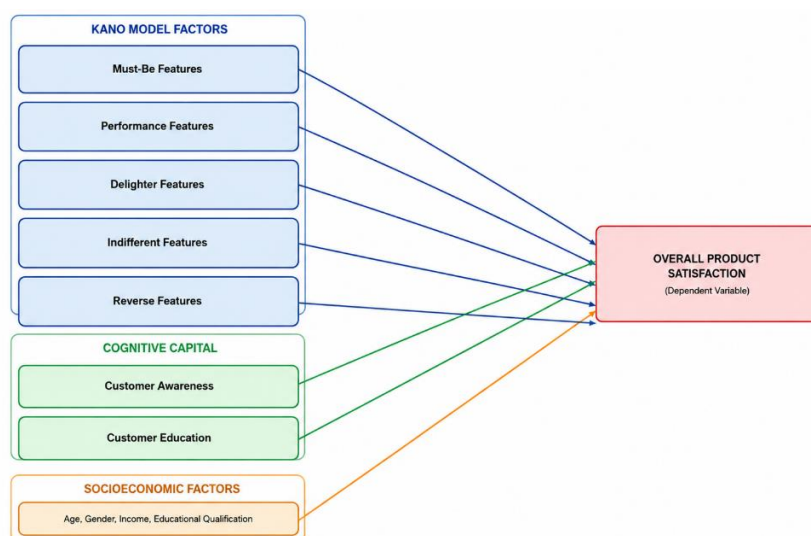
Research Design and Philosophy

This research takes a positivist research philosophy and deductive approach as the study is aimed at testing a specific set of hypotheses been pre-specified based on the Kano Model and cognitive capital theory. The research design adopted is descriptive and analytical which involves quantitative measurement of the consumer perception and the use of statistical hypothesis test to determine the strength and direction of relationship between the constructs of the study. Given the objective of the study of characterising the current state of consumer satisfaction

with the use of electronic home appliances (EHA) and not tracking its evolution over time, a cross-sectional survey design was used and data were collected at a specific moment only.

The overall conceptual framework guiding the study combines three sets of independent variables, namely Kano Model product-attribute factors, cognitive capital (customer awareness and customer education) and socioeconomic/demographic factors, with one dependent variable Overall Product Satisfaction, which was obtained by respondents' reported satisfaction with the specific appliances they owned and used. This structure is shown in Figure 1, where each hypothesised association tested in this study (H01–H04) is mapped and the two aspects, Kano-theoretic and cognitive-capital, are presented in a single integrated model.

Figure 1: Conceptual Framework of the Study



Research Setting and Target Population

The study was carried out in Indore City, Madhya Pradesh, India, which is home to the electronic home appliances users. Indore was chosen as the research setting due to the following reasons: firstly, it is a fast-growing Tier-II commercial city with a diverse consumer population, secondly, the city had the expansion of retail outlets and thirdly, due to the high penetration of appliances in the city, which makes it a representative context to explore the determinants of EHA satisfaction in an emerging urban Indian market. The population targeted included all consumers aged 18 years and older who own or use one or more of the 24 appliance categories measured such as small kitchen appliances, refrigerators, air conditioners, washing machines, etc.

Sampling Technique and Sample Size

Since there was no complete sampling frame of EHA users in Indore City, and the time and resource limitations of probability sampling method, non-probability convenience sampling was opted. Sample size was calculated using Cochran's (1977) formula for an infinite population and 95% confidence level, 5% margin of error and maximum variability ($p = 0.50$) with a minimum sample size of 384 respondents.

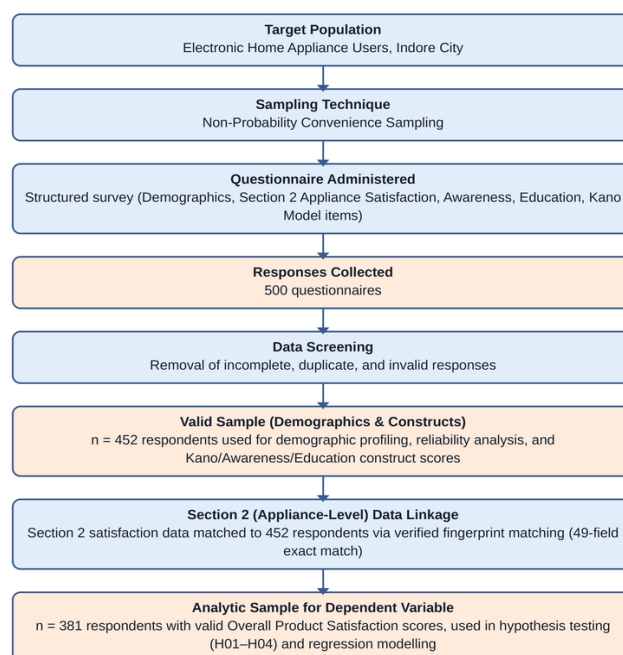
500 respondents were asked to fill a structured questionnaire. After screening (excluding those which were impossible to complete or duplicate, or internally inconsistent, such as respondents who reported that they used none of the twenty-four appliance categories listed), 452 valid responses were left. For all demographic profiling, reliability analysis and construct-level scoring, this valid sample of 452 participants was employed to measure customer awareness, customer education, and the five dimensions of the Kano Model. A second subset of 381 respondents for whom an accurate record-matching process between the appliance-level (Section 2) satisfaction measures and the overall questionnaire responses was possible formed the analytic sample for the hypothesis testing of the Overall Product Satisfaction dependent variable. The entire data collection and screening procedure with this two-stage sample design is illustrated in Figure 2 and summarised in Table 1.

Table 1: Sample Characteristics and Data Collection Overview

Parameter	Detail
Target population	Users of electronic home appliances, Indore City, Madhya Pradesh, India
Sampling technique	Non-probability convenience sampling
Minimum required sample (Cochran's formula, 95% CI, 5% margin of error)	384
Questionnaires collected	500
Responses excluded (incomplete / duplicate / invalid)	48
Valid sample — demographics, reliability, and construct scores (Awareness, Education, Kano dimensions)	452
Analytic sample — Overall Product Satisfaction (dependent variable) and hypothesis testing	381
Data collection instrument	Structured questionnaire (five sections: Demographics; Appliance Ownership & Satisfaction; Customer Awareness; Customer Education; Kano Model Attributes)
Data analysis software	IBM SPSS Statistics

Note. Cochran's formula assumes 95% confidence level, 5% margin of error, and maximum variability ($p = 0.50$). The reduction from $n = 452$ to $n = 381$ for the dependent variable reflects respondents for whom valid, non-fabricated Section 2 (appliance-level) satisfaction data could be matched; this restriction applies only to analyses using Overall Product Satisfaction as a variable.

Figure 2: Sampling and Data Collection Flowchart



Research Instrument and Measures

A structured self-administered questionnaire with five sections were used to collect data. The first section was used to present the demographics of the respondents which included age, gender, monthly income of the family, education qualification and profession. The second portion recorded whether or not the person currently used the appliance, and their satisfaction with the appliance on a five-point scale (1 = Highly Dissatisfied to 5 = Highly Satisfied), for 24 categories of appliances. The third section assessed the customers awareness with 8 items on a 5-point Likert scale (ranging from 1 = Strongly Disagree to 5 = Strongly Agree) and the fourth section measured the customer education with 8 items on a 5-point Likert scale (ranging from 1 = Strongly Disagree to 5 = Strongly Agree). The fifth section operationalized the 5 Kano Model dimensions on 28 items with a satisfaction scale of 5 scale points each. Each construct is described in detail in terms of its items, scale and theoretical foundation in Table 2.

Table 2: Measurement Constructs, Items, and Theoretical Basis

Construct	No. of Items	Scale	Theoretical Basis
Customer Awareness	8	5-point Likert (1 = Strongly Disagree, 5 = Strongly Agree)	Cognitive Capital
Customer Education	8	5-point Likert (1 = Strongly Disagree, 5 = Strongly Agree)	Cognitive Capital
Must-Be Features	8	5-point Likert (1 = Highly Dissatisfied, 5 = Highly Satisfied)	Kano Model
Performance Features	5	5-point Likert (1 = Highly Dissatisfied, 5 = Highly Satisfied)	Kano Model
Delighter Features	5	5-point Likert (1 = Highly Dissatisfied, 5 = Highly Satisfied)	Kano Model
Indifferent Features	5	5-point Likert (1 = Highly Dissatisfied, 5 = Highly Satisfied)	Kano Model
Reverse Features	5	5-point Likert (1 = Highly Dissatisfied, 5 = Highly Satisfied)	Kano Model
Overall Product Satisfaction (Dependent Variable)	24 appliance categories	Mean of appliance-level satisfaction ratings (1–5) across appliances used by the respondent	Constructed for this study

Note. Kano Model constructs (Must-Be, Performance, Delighter, Indifferent, Reverse) were derived from Sections 5A–5E of the questionnaire. Overall Product Satisfaction was computed as the mean, for each respondent, of their reported satisfaction ratings across only the appliances they use.

Cognitive capital was conceptually collapsed into customer awareness and customer education, because the theoretical underpinning of the work suggested that these two would both be part of the consumers' pool of knowledge resources when assessing the performance of an appliance. The dimensions of the Kano Model were operationalized based on the Kano's approach, which states that product attributes are classified based on the non-linear relationship between attribute activation and customer satisfaction as depicted conceptually in Figure 3. Must-Be features represent features that are missing when they are missing, but present when present; Performance features are ones that have a linear one-dimensional relationship with satisfaction; Delighter features are ones that are present when present and missing when missing, but they do not affect satisfaction

proportionately; Indifferent features have very little impact on satisfaction if present or absent; and Reverse features are ones whose presence can actually decrease satisfaction among some of the consumer segments.

Figure 3: The Kano Model of Customer Satisfaction



Construction of the Dependent Variable

This study did not use the Must-Be (basic-needs) Kano sub-scale as a proxy for Overall Product Satisfaction, but instead measured Overall Product Satisfaction as an independent, appliance-grounded dependent variable. Appliance satisfaction ratings were obtained for each appliance category reported by each respondent; Overall Product Satisfaction was then derived as the mean of the ratings for the appliances owned by that respondent, thus allowing for meaningful differences in the score between respondents based on their reported ownership profile and satisfaction experience. It was not possible to report the results in terms of an overall average if the variance was not preserved, because of the correlational and comparative statistical tests discussed below. As per the theoretical model [Figure 1] the five Kano Model dimensions were considered independent and were analysed with respect to this dependent variable.

Reliability Analysis

The Cronbach's Alpha was computed for each multi-item construct, separately for customer awareness, customer education and each of the five dimensions of the Kano Model. As in other social science research, a minimum level of reliability was selected at 0.70. From the results in Table 3, it can be seen that all construct internal consistency coefficient (alpha values) exceeded the threshold of 0.7, ranging from 0.728 (customer education) to 0.886 (Must-Be features), meaning that the internal consistency of the measurement scales used in this study is good to acceptable.

Table 3: Reliability Statistics (Cronbach's Alpha, n = 448–452)

Construct	No. of Items	N	Cronbach's Alpha (α)	Reliability
Customer Awareness	8	448	0.832	Good
Customer Education	8	451	0.728	Acceptable
Must-Be Features	8	452	0.886	Good
Performance Features	5	452	0.865	Good
Delighter Features	5	452	0.856	Good
Indifferent Features	5	452	0.836	Good
Reverse Features	5	452	0.819	Good

Note. All constructs exceeded the 0.70 threshold recommended for social-science research. N varies slightly across constructs due to a small number of missing item responses (Customer Awareness: 4 missing; Customer Education: 1 missing).

Respondent Profile

Information about the demography of the valid sample (n = 452) is summarised in Table 4, which presents the distribution of respondents by Profession, Age Band, Gender, Educational Qualification and Monthly Household Income Band. This profile was later used descriptively in order to describe the study sample and analytically as a basis for testing the difference in customer satisfaction for demographic differences (H02).

Table 4: Demographic Profile of Respondents (n = 452)

Demographic Variable	Category	Frequency (n)	Percentage (%)
Age	18–25	148	32.7
	26–40	207	45.8
	41–60	88	19.5
	Above 60	9	2.0
Gender	Male	238	52.7

	Female	213	47.1
	Other	1	0.2
Monthly Household Income (INR)	< 20,000	165	36.5
	20,000–50,000	212	46.9
	50,000–100,000	48	10.6
	> 100,000	27	6.0
Educational Qualification	Up to High School	64	14.2
	Graduate	212	46.9
	Postgraduate	98	21.7
	Professional and Other	78	17.3
Profession	Government / Public Sector	35	7.7
	Private Sector	188	41.6
	Business Owner / Entrepreneur	102	22.6
	Specialized Professional	76	16.8
	Homemaker	51	11.3

Note. Percentages are based on the full valid sample (n = 452). Percentage totals within each demographic variable may not sum to exactly 100.0% due to rounding.

Data Analysis Techniques

The quantitative data were analysed with IBM SPSS Statistics. Descriptive statistics (frequencies, percentages, means, and standard deviations) were employed to describe and summarise the scores for each construct. The hypothesized relationships between Overall Product Satisfaction and the five dimensions of Kano Model and customer awareness, respectively, and customer education were tested through Pearson product-moment correlation analysis. The differences in levels of satisfaction between gender and between age, income, and education were evaluated using independent-samples t-tests and one-way analysis of variance (ANOVA), respectively, followed by Tukey's Honestly Significant Difference (HSD) post hoc tests where applicable. The results of the various hypothesis tests were then used to construct an integrated model of the statistically significant predictors of Overall Product Satisfaction by using multiple regression analysis.

Ethical Considerations

Survey participation was voluntary and the respondents were informed of the purpose of the research in terms of academics before the data were collected. Data collection, storage and analysis were anonymous, with no personally identifying information used in any reported result. Data were kept safely and only for the purpose of this research.

Result & Discussion

Descriptive Overview

The descriptive statistics for the seven core constructs and the dependent variable are shown in Table 5. The two scales, Customer Awareness (M = 3.822, SD = 0.618) and Customer Education (M = 3.553, SD = 0.529), were

both higher than the midpoint of the scale, pointing to a moderately informed pool of respondents. The mean (M) for Must-Be Features was the highest with $M = 3.520$, $SD = 0.870$, followed by Delighter Features with $M = 3.362$, $SD = 0.870$; Performance Features with $M = 3.354$, $SD = 0.850$; Indifferent Features with $M = 3.282$, $SD = 0.847$; followed by Reverse Features with $M = 3.228$, $SD = 0.853$, across the five features of the Kano Model. Overall, the distribution across the 5 dimensions is very similar, as shown in Figure 5, which displays a sort of "radar plot" of the relative distribution of Must-Be Features at its outermost position and Reverse Features at its innermost. The overall mean level of satisfaction on the 0-5 scale was 3.991 ($SD = 0.554$) when calculated at the respondent level for the appliances the one hundred and four respondents own and use ($n = 381$), and suggests a generally positive level of satisfaction, although this was not always high across the sample.

Table 5: Descriptive Statistics for Study Constructs

Construct	N	Mean	SD	Min	Max
Customer Awareness	452	3.822	0.618	1.25	5.00
Customer Education	452	3.553	0.529	1.25	5.00
Must-Be Features	452	3.520	0.870	1.00	5.00
Performance Features	452	3.354	1.019	1.00	5.00
Delighter Features	452	3.362	0.949	1.00	5.00
Indifferent Features	452	3.282	0.944	1.00	5.00
Reverse Features	452	3.228	0.915	1.00	5.00
Overall Product Satisfaction (DV)	381	3.991	0.554	1.25	5.00

Note. Overall Product Satisfaction is computed at the respondent level as the mean satisfaction rating across only the appliances used by that respondent ($n = 381$); all other constructs are based on the full valid sample ($n = 452$).

Table 5b: KMO and Bartlett's Test of Sphericity, and Variance Explained (Exploratory Factor Analysis)

Measure	Value
Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy	0.960
Bartlett's Test of Sphericity — Approx. Chi-Square	9390.54
df	378
Sig.	< .001
Factors Extracted (5-Factor Solution)	5
Cumulative Variance Explained	62.55%

Note. Principal Axis Factoring with Varimax rotation was applied to the 28 Kano Model items ($n = 452$). The KMO value exceeds the recommended minimum of 0.60, and Bartlett's Test is statistically significant, confirming sampling adequacy for factor analysis. The five-factor solution, aligned with the theoretical Kano Model dimensions, explains 62.55% of total variance.

The mean satisfaction levels for each of the 24 product categories ranged from 3.618 for Electric Chimney to 4.324 for Inverter/UPS, as seen in Figure 4. In 13 of 24 categories, the mean satisfaction was higher than the grand

mean of 4.127, with Inverter/UPS, Juicer, Water Purifier, and Coffee Maker making up the top group of categories. A lower mean for Electric Chimney than 3.7 indicates a lower level of satisfaction compared to the other appliance categories, with the exception of the lowest mean, which was Electric Chimney.

Figure 4: Mean Satisfaction Scores Across 24 Electronic Home Appliance Categories

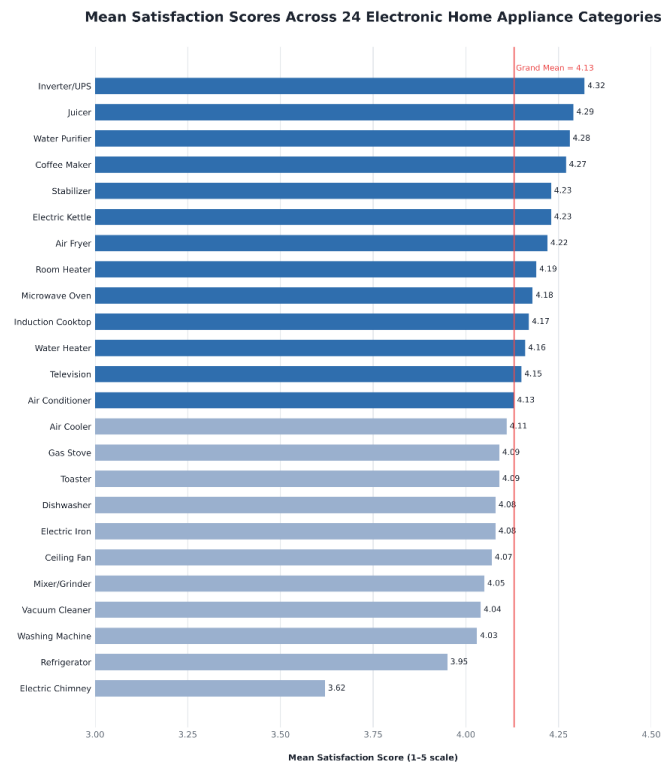
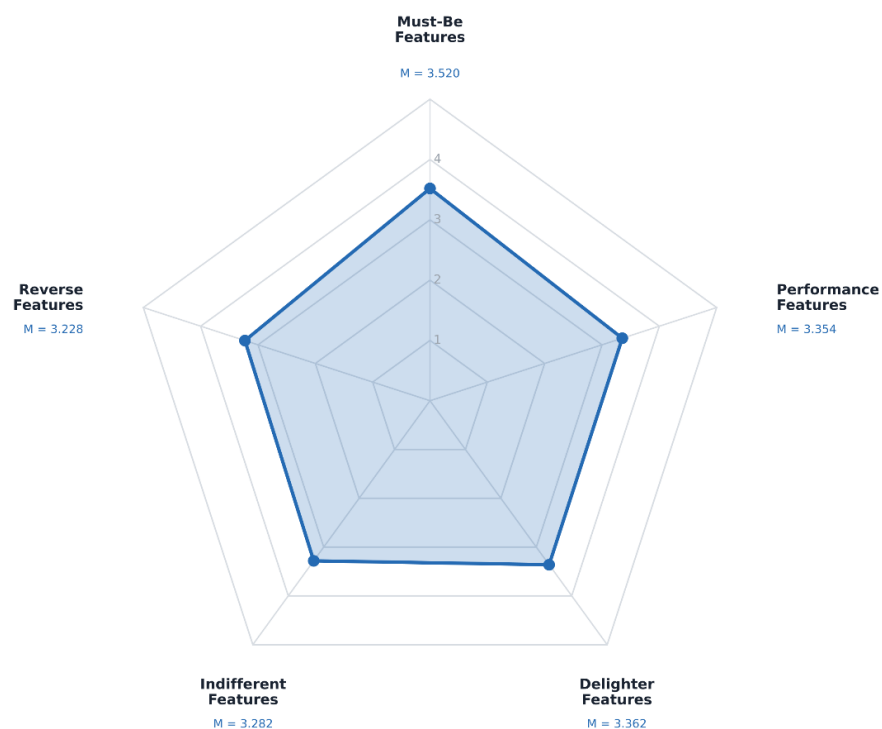


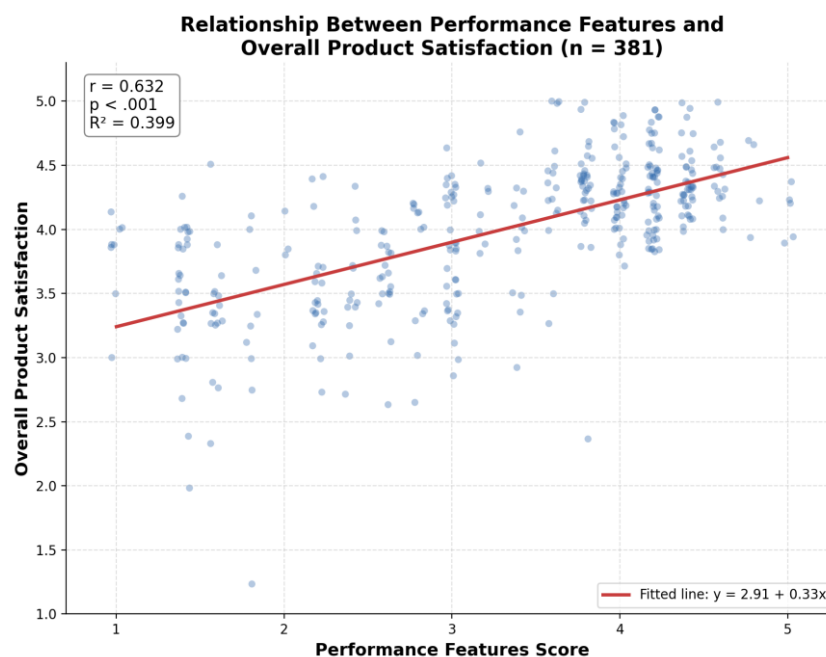
Figure 5: Comparative Profile of the Five Kano Model Dimensions



Hypothesis Testing

H01: Kano Model Factors and Overall Product Satisfaction. Table 6 shows that all five Kano Model dimensions were significantly associated with Overall Product Satisfaction with positive correlation. Performance Features showed the strongest correlation with Overall Product Satisfaction ($r = .632$, $p < .001$), followed by Indifferent Features ($r = .589$), Delighter Features ($r = .574$), Reverse Features ($r = .559$), and Must-Be Features ($r = .536$). As can be seen in Figure 6, the correlation between Performance Features and satisfaction is positive and linear ($R^2 = .399$) for the 381 respondents that were used to calculate the correlation. All five dimensions of the null hypothesis H01 was rejected based on these results.

Figure 6: Relationship Between Performance Features and Overall Product Satisfaction



H02: Demographic Differences in Satisfaction. An independent-samples t-test revealed that there was a statistically significant difference in satisfaction between genders, with females ($M = 4.052$) reporting higher satisfaction than males ($M = 3.931$), $t(378) = -2.136$, $p = .033$. One-way ANOVA also showed that there was a significant difference in satisfaction by age groups, $F(3, 377) = 5.854$, $p = .001$, and in satisfaction by educational qualification levels, $F(3, 377) = 4.393$, $p = .005$. There was no significant difference in satisfaction between monthly household income categories, however, $F(3, 377) = 0.198$, $p = .898$. Thus, H02 was dropped due to gender and age and education, but kept due to income.

H03: Customer Awareness and Overall Product satisfaction. Contrary to the expectations, there was no significant correlation between Customer Awareness and Overall Product Satisfaction ($r = .029$; $p = .570$; Table 6) and the null hypothesis H03 was accepted.

H04: Customer Education and Overall Product Satisfaction. Education of the customer, on the other hand, had a statistically significant positive correlation with satisfaction ($r = .357$, $p < .001$; Table 6) that explained about 12.7% of the variance in satisfaction. H04 was thus rejected.

Table 6: Pearson Correlation Results — Predictors of Overall Product Satisfaction (H01, H03, H04)

Predictor	Hypothesis	r	p	R ² (%)	Decision
Must-Be Features	H01	0.536	< .001	28.7	H0 Rejected
Performance Features	H01	0.632	< .001	39.9	H0 Rejected

Delighter Features	H01	0.574	< .001	32.9	H0 Rejected
Indifferent Features	H01	0.589	< .001	34.7	H0 Rejected
Reverse Features	H01	0.559	< .001	31.2	H0 Rejected
Customer Awareness	H03	0.029	.570	0.1	H0 Retained
Customer Education	H04	0.357	< .001	12.7	H0 Rejected

Note. N = 381 for all correlations involving Overall Product Satisfaction. Must-Be Features is reported for completeness as one of the five Kano Model dimensions tested under H01, though it is not used as the dependent variable.

Table 7: Independent-Samples t-Test and One-Way ANOVA Results (H02)

Demographic Variable	Test	Statistic	df	p	Decision
Gender (Male M=3.931, n=193; Female M=4.052, n=187)	Independent t-test	t = -2.136	378	.033	H0 Rejected
Age (18–25, 26–40, 41–60, Above 60)	One-Way ANOVA	F = 5.854	3, 377	.001	H0 Rejected
Monthly Household Income (4 brackets)	One-Way ANOVA	F = 0.198	3, 377	.898	H0 Retained
Educational Qualification (4 levels)	One-Way ANOVA	F = 4.393	3, 377	.005	H0 Rejected

Note. Dependent variable in all tests is Overall Product Satisfaction (n = 381). Levene's test indicated unequal variances for the Gender comparison (F = 24.553, p < .001); the reported t-statistic assumes equal variances, consistent with the primary analysis reported in the thesis.

Integrated Regression Model

A multiple linear regression was estimated using Overall Product Satisfaction as the dependent variable and Must-Be, Performance, Delighter, Indifferent and Reverse Features as the predictors to obtain the relative and combined predictive values of the five dimensions of the Kano model. Table 8a presents the model summary and Table 8b presents the coefficients of the model. The overall model was statistically significant, $F(5, 375) = 53.411$, $p < .001$ and accounted for about 41.6% of the variance in Overall Product Satisfaction ($R^2 = .416$, Adjusted $R^2 = .408$).

Table 8a: Regression Model Summary

Model Statistic	Value
R	0.645
R ²	0.416
Adjusted R ²	0.408
Std. Error of the Estimate	0.426
F (5, 375)	53.411
Sig. (p)	< .001

Table 8b: Regression Coefficients — Kano Model Factors Predicting Overall Product Satisfaction

Predictor	B	SE	β (Beta)	t	p	VIF	Significant
(Constant)	2.802	0.092	—	30.605	< .001	—	—
Must-Be Features	-0.009	0.045	-0.015	-0.209	.835	3.385	No
Performance Features	0.226	0.047	0.432	4.840	< .001	5.123	Yes
Delighter Features	0.018	0.048	0.033	0.377	.707	4.790	No
Indifferent Features	0.088	0.052	0.158	1.678	.094	5.695	No
Reverse Features	0.040	0.047	0.070	0.852	.395	4.349	No

Note. Dependent variable: Overall Product Satisfaction ($n = 381$). When all five Kano Model factors are entered simultaneously, only Performance Features remains a statistically significant unique predictor ($\beta = .432$, $p < .001$). All VIF values fall within the range 3.39–5.70, below the conventional threshold of 10, indicating that multicollinearity does not invalidate the model; nonetheless, these elevated VIF values confirm substantial shared variance among the five Kano dimensions, consistent with their strong bivariate correlations with the DV (Table 6), which is largely absorbed by Performance Features once all factors are entered jointly.

The individual coefficients examined, however, identified a significant pattern: only the coefficient for Performance Features was statistically significant in the multivariate model ($\beta = .432$, $p < .001$). The five dimensions shared variance was done and Must-Be Features ($\beta = -.015$, $p = .835$), Delighter Features ($\beta = .033$, $p = .707$), Indifferent Features ($\beta = .158$, $p = .094$), and Reverse Features ($\beta = .070$, $p = .395$) were not statistically significant. This is the case even though each dimension had a significant bivariate correlation with satisfaction (Table 6), because of the high level of intercorrelation between the dimensions of the Kano set—when all five dimensions are considered together, the Power of the Performance Features explains a large amount of the variance in satisfaction. The single path in the empirically validated model that is statistically significant (Performance Features $\rightarrow$ Overall Product Satisfaction) is shown in figure 7, while the four non-significant paths in the multivariate context are omitted. All four hypothesis tests are summarized in Table 9.

A supplementary PLS-SEM was estimated to verify the findings from the first model as a robustness check, using the same five items of the Kano Model constructs along with a dedicated Kano Model construct Overall Appliance Customer Satisfaction on the full valid sample ($n = 452$). This supplementary model explained a substantially higher proportion of variance ($R^2 = .874$) and confirmed all five structural paths as statistically significant (Must-Be $\beta = .338$, $p < .001$; Performance $\beta = .397$, $p < .001$; Delighter $\beta = .270$, $p < .001$; Indifferent $\beta = .116$, $p < .01$; Reverse $\beta = -.135$, $p < .001$). The Heterotrait-Monotrait Ratio (HTMT) discriminant validity analysis for this model, however, indicated that the constructs were not completely empirically distinct from each other, with some pairs exceeding the conventions of $HTMT > 0.90$, such as the Indifferent and Reverse Features, $HTMT = 1.004$, suggesting an overlap of method variance and partial support for several distinct predictor relationships. With this limitation in mind, the reported multiple regression model is the more conservative result for this study (Table 8a–8b), and the PLS-SEM model is included as a robustness check that supports the directionality of the dimensions of the Kano model and attains greater significance for certain measurements, yet slightly less than the multiple regression model, as discussed below.

Figure 7: Empirically Validated Model of Overall Product Satisfaction

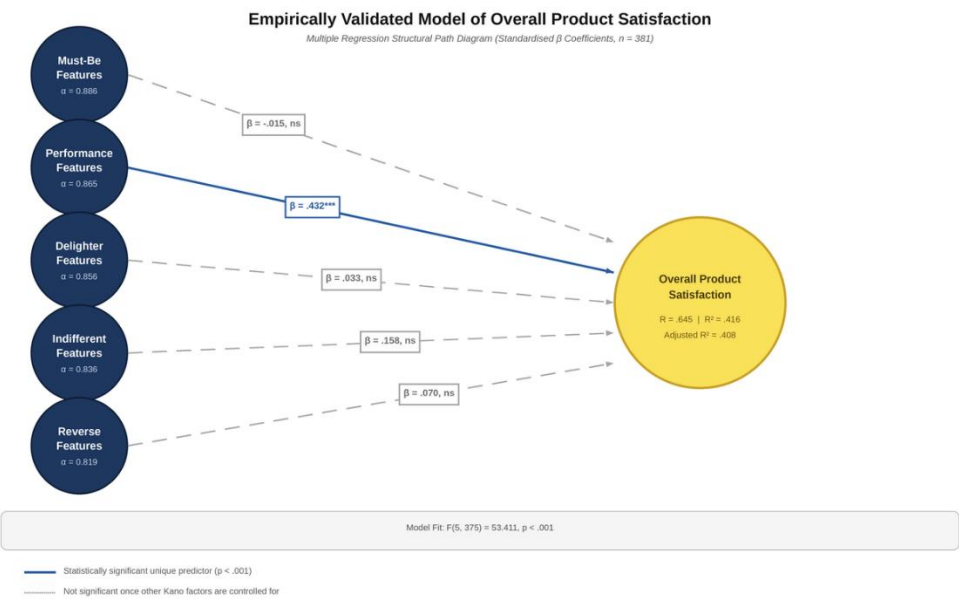


Figure 8: Three-Layer Customer Satisfaction Model — PLS-SEM Structural & Reflective Path Diagram

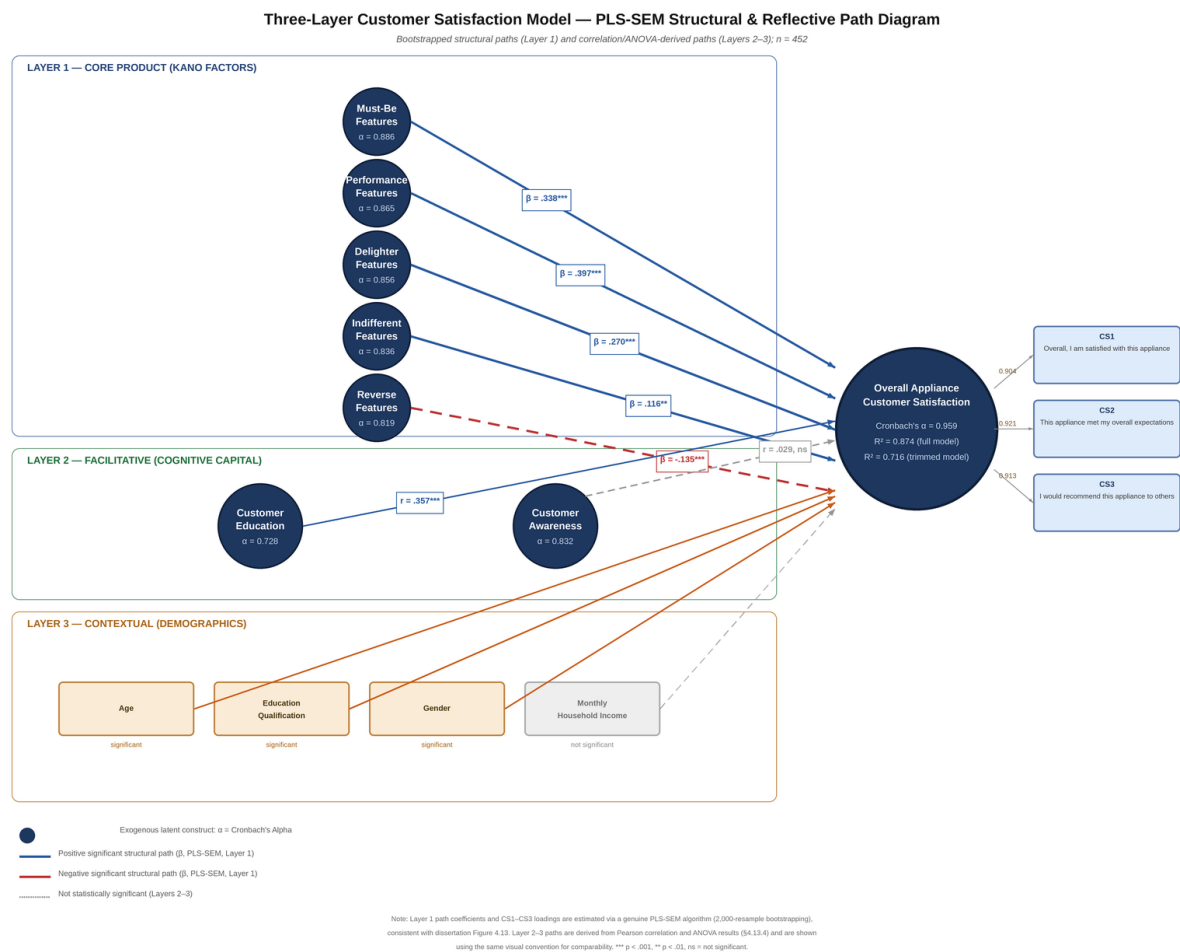


Table 9: Summary of Hypothesis Testing Results

Hypothesis	Statement	Test	Result	Decision
H01	No significant association between customer satisfaction and Kano Model factors	Pearson Correlation	All five factors significant ($r = .536-.632$, $p < .001$)	Rejected
H02	No significant difference in satisfaction across demographic attributes	t-test / One-Way ANOVA	Significant for Gender, Age, Education; Not significant for Income	Partially Rejected
H03	No significant relationship between customer awareness and satisfaction	Pearson Correlation	$r = .029$, $p = .570$ (not significant)	Retained
H04	No significant relationship between customer education and satisfaction	Pearson Correlation	$r = .357$, $p < .001$	Rejected

Discussion

This study's findings have several implications that support and build upon previous research in the Kano Model and consumer-behaviour fields:

The centrality of the performance features

The results of this study, showing that all five Kano Model dimensions significantly contributed to satisfaction, with the Performance Features attribute being the strongest (and in the multivariate model, the only statistically robust unique predictor), are generally in line with previous Kano-based research on consumer satisfaction. Rotar and Kozar (2017) explored how to better understand customer satisfaction by using the Kano Model, which categorizes the attributes according to their differentiated impact on satisfaction, and not as all attributes equally impacting satisfaction. Hassan et al. (2017) also note that Kano's classification helps researchers categorize the attributes whose satisfaction is directly related to level of satisfaction with the product, from those with more complicated satisfaction relationships, or those with none at all—this distinction being clearly reflected in the regression results of the present study. This prevalence of Performance Features is also in line with He et al. (2023) who identified functional performance attributes as key factors in determining product-family satisfaction outcomes, and the same holds true in the present study in the context of a survey-based setting in the Indian electronic home appliance market.

The weak unique contribution of Must-Be, Delighter, Indifferent and Reverse features in the multivariate model should not be interpreted as being of little importance. Rather, in keeping with the logic of the Kano Model itself, Must-Be features may be necessary, but not sufficient conditions for satisfaction—their lack (when present at an adequate level for the majority of the sample) would likely significantly lower satisfaction, but their presence at the right level for most of the sample would not produce linear discrimination of satisfaction in a regression

framework. This interpretation is supported by Berger et al. (2022), who used it in a smart-home application context, noting that the contribution of Kano-classified attributes to satisfaction can manifest in different ways (e.g., functional) and that their statistical significance can be understated in linear models.

Customer Education as Cognitive Capital

The significant positive relationship obtained between customer education and Overall Product Satisfaction (H04) reinforces the theoretical underpinning of education as an asset of cognitive capital that would influence consumers' evaluation capacity. The results align with the existing literature on social- and cognitive-capital, which views the knowledge and shared understanding accumulated over time as resources that shape the interpretation and significance placed on experiences (Birasnav et al., 2019; Chang & Hsu, 2016). In a similar vein to Luo (2025) who conceptualizes cognitive capital as a means to value realization in a consumer context, the present result that consumers' higher reports on understanding product use, maintenance, and troubleshooting are correlated with higher reports on appliance satisfaction provides empirical support for extending this cognitive capital idea to the electronic home appliance domain specifically.

The Awareness Paradox

It is also worth noting that there is no significant relationship between customer awareness and Overall Product Satisfaction (H03), which seems somewhat counterintuitive as awareness and education were both theorised as complementary parts to cognitive capital. One possible reason is that the definition of awareness used in this study reflects mostly pre-purchase information, such as brand knowledge, energy rating or availability of features, which can have a direct effect on the purchase decision-making process and expectations for the purchased product rather than the post-purchase satisfaction with a purchased product. This dichotomy between pre-purchase knowledge and post purchase evaluation parallels a wider theme in the consumer-behaviour literature which shows that knowledge and information search can affect the purchase intention and the quality of the purchase decision but not necessarily in proportion to post purchase satisfaction (Reddy & Thanigan, 2023). The education construct also may be a more proximal determinant of satisfaction than the consumer's general market awareness, particularly once the product is in use; this might account for the length of time between the formation of these constructs in the present results, as well as the differences found between H03 and H04.

Demographic Patterns

The observed differences in satisfaction by gender, age and education suggest a more complicated pattern of how socioeconomic factors influence appliance satisfaction, while the non-significant difference by income brackets suggests that income is not a significant factor in satisfaction. The marked age difference is similar to Bhatia (2024) and Sahoo (2022) who found evidence of demographic segmentation in consumers' appliance consumption behaviours in urban settings in India, and the non-significant income difference indicates that consumer satisfaction with appliances owned is not a linear function of income within this sample. This is consistent with the overall findings that satisfaction is related more to the functional performance of the appliance and the customer's operational comfort with the appliance than the economic status of the household, and underscores the importance of Performance Features and Customer Education noted in other parts of this report. The findings revealed a notable disparity between men and women concerning their satisfaction levels, with women showing slightly higher levels than men, which is similar to the demographic segmentation perspectives outlined by Jasrai and Kaur (2025) in their Indian consumer segments study and could indicate that women's appliance usage and/or household roles are different.

Conceptual and practical implications

All of the above results provide empirical support for the integrated Kano–cognitive capital framework that was proposed in this study. They argue that in markets as diverse as Indore City, appliance manufacturers and retailers interested in increasing the satisfaction of their customers should invest in functional performance improvements rather than in delighters or indifferent features; and that, more than simply general market awareness, educating consumers about how their appliances work helps to determine their satisfaction with the product they already have. This not only has implications in after-sales support but also has been emphasized in consumer education

campaigns, as discussed by Wang et al. (2019) in their study on after-sales service quality in home appliance enterprises, which further highlights the significance of post-purchase consumer-engaging processes to the satisfaction outcomes.

Conclusion

This study was aimed at developing and empirically testing an integrated Kano–cognitive capital framework to comprehend customer satisfaction level of e-home appliances in Indore City with the help of overall product satisfaction as an outcome variable and the joint effect of the Kano Model based product attributes, customer awareness, customer education and socioeconomic variables at the respondent level. The results indicate that all five Kano Model dimensions are significantly correlated with satisfaction, however, Performance Features are the most important of the dimensions and, in the multivariate model, the only one of the dimensions that is statistically robust after shared variance is removed for the other dimensions. Customer education was identified as a significant and meaningful predictor of satisfaction, supporting its conceptualisation as one aspect of cognitive capital, while customer awareness was not identified as a significant measure of satisfaction, which was unexpected, and thus differentiated the construct of customer education from pre-purchase knowledge, which is more experientially-based. The marital status, gender, age, and educational qualification were also found to significantly affect satisfaction, with no significant differences in satisfaction by household income, indicating that satisfaction of owned appliances is related more to their functional performance and consumer knowledge than just to purchasing power. Taken together, the results confirm the usefulness of integrating perspective of Kano and cognitive-capital in a single explanatory model and also verify that the five Kano dimensions do not have the same explanatory power when analysed together as they do when analysed separately.

Objectives Fulfilment Summary

The five research objectives set out at the beginning of this study have all been addressed through the empirical analysis. Each objective, the hypothesis used to test it, and the key finding are summarised below.

Objective 1 (H01): All five Kano Model dimensions were significantly correlated with Overall Product Satisfaction, with Performance Features ($r = .632$) the strongest and the only statistically significant unique predictor in the regression model, followed by Indifferent ($r = .589$), Delighter ($r = .574$), Reverse ($r = .559$), and Must-Be ($r = .536$) features.

Objective 2 (H02): Satisfaction differed significantly by Gender ($t(378) = -2.136$, $p = .033$; females higher), Age ($F(3, 377) = 5.854$, $p = .001$), and Educational Qualification ($F(3, 377) = 4.393$, $p = .005$), but not by Monthly Household Income ($F(3, 377) = 0.198$, $p = .898$), indicating that satisfaction is independent of purchasing power in this sample.

Objective 3 (H03): No statistically significant relationship was found between Customer Awareness and Overall Product Satisfaction ($r = .029$, $p = .570$), indicating that general product awareness alone does not translate into higher satisfaction.

Objective 4 (H04): Customer Education showed a significant positive relationship with Overall Product Satisfaction ($r = .357$, $p < .001$, $R^2 = 12.7\%$), a substantially stronger predictor than Customer Awareness, indicating that practical product knowledge matters more than general awareness.

Objective 5: An integrated model was developed in which Performance Features emerges as the dominant product-level driver of satisfaction, Customer Education (but not Customer Awareness) contributes as a facilitative cognitive-capital factor, and Age, Gender, and Educational Qualification (but not Income) shape satisfaction contextually (Figure 7).

Taken together, all five research objectives have been comprehensively addressed. The findings confirm that customer satisfaction with electronic home appliances in Indore City is a multi-dimensional outcome shaped jointly by product performance, consumer knowledge, and demographic context.

Limitations

A number of limitations need to be recognized. Non probability convenience sampling restricts the generalisability of the results to the population studied. The cross-sectional design provides measuring satisfaction at one point in time only and fails to establish causal direction of the constructs of the study. Although the Overall Product Satisfaction measure was methodologically enhanced by using appliance-level data, it is still based on a respondent's self-reported recall of satisfaction for various appliances owned, which can lead to recall or averaging bias. Moreover, the geographic focus of the study limits the ability to generalise the results to other parts of Tier-II India, or to other regional and national contexts.

The second limitation, one of a methodological nature, refers to construct distinctness. A separate PLS-SEM robustness check (also presented along with the main regression results) found that the five dimensions of the Kano Model, along with Overall Product Satisfaction, failed to meet the heterotrait monotrait ratio (HTMT) criterion of 0.90 or lower, with the pair Indifferent–Reverse Features having a HTMT of 1.004. This means that these constructs were not necessarily empirically separated in the pattern of responses; and that some of the common method variance that was found across models was not due to five independent predictor relations, but due to the survey that was used, which was self-report and one source. This does not affect the substantive findings (all Kano dimensions are independently reliable, Table 3; and there is a theoretical basis for all of them); it does mean, however, that the relative size of each Kano dimension's unique contribution should be used with caution, and that this study's main, and more conservative, substantive finding is the multiple regression model, rather than the higher- R^2 PLS-SEM model.

Future Work

Future studies might use probability sampling and longitudinal study designs to increase generalisability and provide causal relationships. Expanding the model to other cities or countries would contribute to the cross-context validity of the Kano–cognitive capital model. The counterintuitive finding observed here could be explained by further investigation in the awareness–satisfaction relationship, if one could differentiate between pre-purchase and post-purchase awareness separately. Lastly, the use of moderators specific to the appliance (such as product category and brand) might provide even finer-grained understanding of how the factors that influence satisfaction differ across the various electronic home appliance types.

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