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Kano Model-Based Product Design Integrating Iranian Culture and Lifestyle (Case Study: Refrigerator-Freezer)

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Abstract

This research looks into how everyday cultural habits and lifestyle characteristics unique to Iranian society can shape how household appliances, especially refrigerator-freezers, are designed. Appliances do more than just serve practical functions; they often reflect their users' identity, routines, and values. With that in mind, the study set out to better understand what Iranian consumers need and prefer when it comes to storing food and using kitchen appliances. Researchers used the Kano model, a well-established approach for understanding customer satisfaction, to gather insights. A custom questionnaire with 15 pairs of questions, specifically focused on side-by-side refrigerator features, was given to 250 people from various regions of Iran. From that group, 141 valid responses were collected and examined. The feedback was sorted into six key categories based on how each feature affected satisfaction. Of the various elements studied, four stood out as particularly crucial, reflecting deep cultural and lifestyle connections. One of the key findings was that Iranians tend to store both cooked and raw ingredients in large quantities, a behavior shaped by traditional cooking styles, household structures, and shopping routines. These patterns suggest that to truly meet local expectations and needs, refrigerator design should be closely aligned with the everyday realities of Iranian households.

Keywords

Culture-Oriented Design, Refrigerator, Kano Model, Lifestyle.

Introduction

This article emphasizes that product design is closely tied to users' needs and lifestyle patterns (Kumar et al., 2025; Liu & Sayuti, 2024; Qingfeng et al., 2024), with every product intended to meet specific aspects of daily life in a given region. By examining everyday objects, one can understand a society's behavior (Moustafa, 2024; Wu, 2024), culture, and traditions. However, in countries with underdeveloped industrial and design sectors, the consumption of imported products, often incompatible with local lifestyles, has become widespread. This disconnect is especially evident in societies that have not developed products aligned with their cultural values (Moustafa, 2024). Globalization, as noted by spheres (Ergashev & Farxodjonova, 2020), has profoundly influenced all aspects of life, including the economy, politics, and everyday behavior. As Gennadievich et al. (2022) explain, cultural globalization follows economic globalization, leading to a blending or loss of local cultural identities in some cases. In contrast, countries like Japan have resisted this trend by prioritizing cultural alignment (Ruotsalainen, 2025) in consumption, such as choosing traditional meals and local media, thus preserving their national identity. This resistance contrasts with many societies that unknowingly adopt foreign lifestyles at the expense of their own. The scholars use the concept of globalization (Liu, 2024) to explore why some cultures dissolve while others persist. In this context, UNESCO defines cultural diversity (Ji & Li, 2025; Yousif & Ramirez, 2024) as a broad spectrum encompassing not only art and literature but also traditions, beliefs, lifestyles, and shared values. Culture can be understood in two main ways:

1. The anthropological approach, which focuses on shared behaviors, values, and customs as per Gonzalez Londono (2020),

2. The functional perspective, which emphasizes human activities and their intellectual or artistic outcomes. Culture shapes the meaning of products and is reflected in their design and features.

According to Yousif (2020), incorporating cultural elements into product design enhances user satisfaction and supports the preservation of cultural identity. This alignment also strengthens cultural *soft power* through user-product interactions. As Boonpracha (2021) notes, the integration of traditional culture (Zong et al., 2023) into modern design is now a global trend. Qin and Ng (2020) further highlight how traditional cultural qualities can be creatively adapted into modern products, influencing contemporary lifestyles. Ultimately, the culture of users is a major factor in product acceptance. Designers must align product concepts with cultural values to evoke emotional satisfaction, the core of user experience. As Yousif et al. (2020) argue, understanding cultural context helps designers create emotionally resonant products, enhancing both user response and organizational success.

Lifestyle Patterns and Culture

Lifestyle is a stable pattern of behaviors and orientations shaped by social interactions, consumption, and values, noting that people now interact more with objects than with others. Global transformations, political, technological, and cultural, have significantly altered lifestyles, creating inter- and intra-societal variation and generational shifts (Esmaeili Josheghani et al., 2020). To understand how culture and identity influence design, the article turns to *social identity theory*, which explores how individuals differentiate in-group (national) and out-group (foreign) behaviors based on various affiliations (Sanaei & Poursalimi, 2018). Emotional attachment to one's homeland, rooted in history and ethnicity, plays a critical role in identity formation, which is further shaped by social and environmental interactions (Jahangiri & Teimouri, 2021). Culture is described as the collective memory of a society, and identity as its essence. The tension between modernity and traditional Iranian identity calls for design approaches that preserve cultural heritage while embracing innovation (Sharifzade, 2018). For example, Iranian households typically cook in bulk, store both fresh and cooked meals, and frequently prepare traditional dishes requiring multiple ingredients and tools. These habits create demand for high-capacity refrigeration, multiple compartments, and accessibility for various family members. For instance, tea consumption, a staple in daily life, makes hot water dispensers a culturally significant feature.

Historical examples such as Britain's 1851 *Design Journal* and Sweden's 1930s *Swedish Modern* movement demonstrate successful integration of national identity into design, culminating in the *Scandinavian design* movement (Mordhorst, 2021). Finally, the text critiques the late-stage addition of aesthetics in product design. Instead, it advocates for aesthetic considerations to be embedded throughout the design process to maintain cultural coherence and avoid superficial outcomes (Baxter, 1995).

The Importance of Identifying User Needs

Following the modernist focus on functionality, the postmodern era in product design emphasized emotional, social, and ethical dimensions, prompting designers to adopt more human-centered approaches (Ghodusinezhad et al., 2015). Multinational companies encountered cultural and economic complexities that rendered one-size-fits-all strategies ineffective (Jin et al., 2015). Designers often overlook user perspectives, yet today's consumers are selective and expect products tailored to their needs. This shift has made user-centric design a strategic imperative (Koleini & Khorram, 2008). Emotional and sensory attributes such as aesthetics, symbolism, and cultural relevance are now critical in differentiating products, especially as the cost of enhancing functional features rises (Jin et al., 2022). Customer satisfaction is shaped by perceived performance versus expectations dissatisfaction (Ummi et al., 2021). Confidence in product quality (Chen et al., 2019), and prior experiences (Stauss et al., 2019). Negative experiences, if unaddressed, may result in loss of loyalty and harmful word-of-mouth, particularly through social media (Azemi et al., 2020; Kwok, 2021). Dissatisfied customers often hold insights that can inspire innovation, making follow-up and engagement with them a key strategy (Duverger, 2011). Customer satisfaction is a vital non-financial metric, linked to loyalty, reputation, and financial performance (Hallencreutz & Parmler, 2021). In Iran, sanctions and rising prices of imports have led to increased acceptance of domestic appliances. Brands like Snowa, Emersun, and Himalia have gained market traction alongside global competitors. However, challenges remain in creating culturally resonant designs. Aligning product aesthetics and functionality with Iranian lifestyles is critical for self-sufficiency and economic development (Akbari et al., 2017).

Methodology

In this research, to achieve the goal of identifying the needs of an Iranian user concerning household refrigerators, the Kano method was used. These methods are briefly explained below:

Kano Model

The Kano model (Bao et al., 2024), was developed by Professor Noriaki Kano in 1984 (Dash, 2021). The Kano Model Analysis (KMA) is a customer preference ranking technique that is a widely used tool for understanding the voice of the customer and its impact on customer satisfaction.

Advantages for Designers and the Design Process

Prioritization of Features: The Kano method helps designers prioritize product features by classifying them into categories such as Must-Be, One-Dimensional, Attractive, Indifferent, and Reverse. This allows for the efficient allocation of resources to elements that significantly impact user satisfaction (Matzler & Hinterhuber, 1998).

- Enhanced User-Centered Design: By integrating user feedback early, designers can create products that align with user expectations, reducing the risk of costly redesigns later in the process (Sauerwein et al., 1996).
- Improved Decision-Making: The method provides a structured framework for evaluating trade-offs, enabling designers to make data-driven decisions based on user preferences rather than assumptions (Kano, 1984).

- Dynamic Adaptation: It supports iterative design by allowing designers to adapt to changing user needs over time, ensuring the product remains relevant (Xu et al., 2009).

For analyzing this diagram, customer needs are classified into the following categories:

- Attractive (A): Fulfilling these needs creates excitement and delight in customers, but their absence does not cause dissatisfaction.
- Must-be (M): These needs are considered basic requirements by customers. Meeting them does not significantly increase satisfaction because they are expected features of the product, but their absence leads to severe dissatisfaction.
- One-dimensional (O): The fulfillment of these needs leads to customer satisfaction, while inadequacy leads to dissatisfaction. These needs are linear and symmetrical because they are usually associated with explicit customer expectations.
- Indifferent (I): Whether these needs are met or not, they neither create customer satisfaction nor dissatisfaction.
- Reverse (R): These are factors that, if present, cause customer dissatisfaction and, if absent, lead to satisfaction.
- Questionable (Q): This category indicates that either the question was phrased incorrectly, the customer misunderstood the question, or the response was illogical.

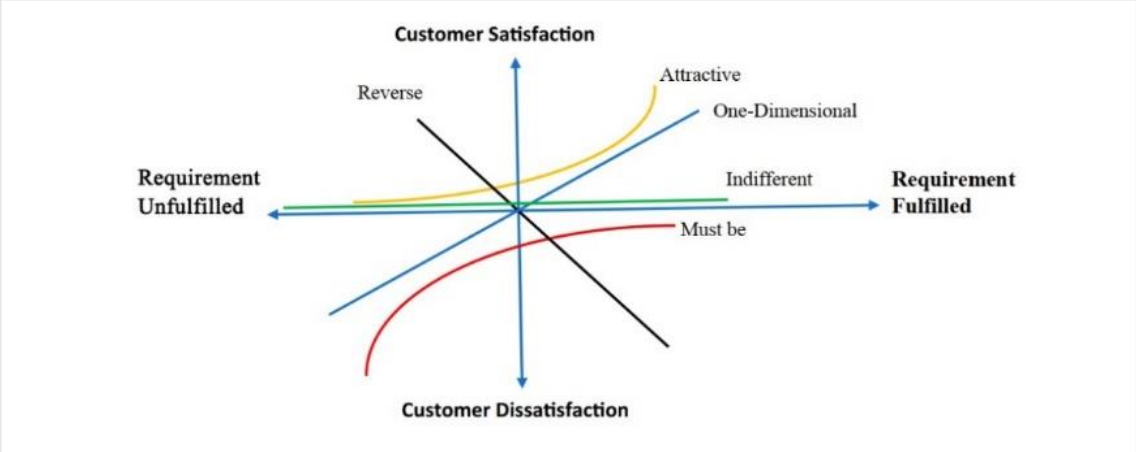

Figure 1: *Kano Model (Dash, 2021).*

Consumers' perception of the quality of services and products varies; therefore, service attributes may be classified differently in the Kano model. On the other hand, confidence in quality significantly impacts customer satisfaction. Thus, service providers can gain a competitive advantage and maintain their market position (Shulman & Gu, 2024) by offering high added value and essential quality features (Chen et al., 2019). The following step-by-step method is typically used to conduct a Kano model analysis (Prasad et al., 2019);

Step 1: Identifying Customer Needs

Customer needs are usually identified through personal interviews with customers or focused group discussions with members already familiar with the product or service. Focused group discussions are helpful for identifying attractive needs, whereas individual interviews are useful for identifying one-dimensional needs.

Step 2: Developing and Implementing the Kano Questionnaire

The Kano questionnaire is presented as a pair of questions in functional and dysfunctional forms for each customer need. This helps categorize customer needs into the six Kano categories. There are five possible responses for each pair of questions: Like, Must-be, One-dimensional, Neutral, Can live with, and Dislike.

Table 1 shows the traditional format of the Kano questionnaire, which is to be administered to customers to gather their responses for each customer need. Customers are asked to indicate their answers by checking the appropriate box. Before distributing the Kano questionnaires, it is recommended to conduct group interviews rather than merely distributing and collecting the questionnaires. Since the Kano questionnaire may be unfamiliar to respondents (customers), it is necessary to explain the objectives of the survey and provide guidance on how to complete the questionnaires. Based on the customer's responses to both forms of the question, the customer's need is classified, by referring to the Kano evaluation table (Table 2), into one of the six Kano categories for that customer.

Table 1: *Kano Questionnaire Template.*

Question No.	Kano Question	Customer's Response				
		I like it that way	I must be the way	I am neutral	I can live with that way	I dislike it that way
1	Functional from of the question					
	Dysfunctional form of the question					

Table 2: *Kano Evaluation Table.*

Customer Requirements		Dysfunctional (Negative) Question				
		Like	Must-be	Neutral	Live With	Dislike
Functional (Positive) Question	Like	Q	A	A	A	O
	Must-be	R	I	I	I	M
	Neutral	R	I	I	I	M
	Live with	R	I	I	I	M
	Dislike	R	R	R	R	Q

Note; A: Attractive, M: Must-be, R: Reverse, O: One dimensional, Q: Questionable, I: Indifferent.

Step 3: Evaluation and Interpretation of Results

The levels of customer needs expectations can be evaluated and interpreted based on the frequency of responses to the Kano questionnaire survey. To estimate the average impact on customer satisfaction, the Customer Satisfaction (CS) index is recommended. It is calculated by dividing the sum of the frequencies of Attractive needs (fA) and One-dimensional needs (fO) by the total of the frequencies of Attractive (fA), One-dimensional (fO), Must-be (fM), and Indifferent needs (fI). The mathematical expression for CS is given below:

$$CS_i = \frac{f(A) + f(O)}{f(A) + f(O) + f(M) + f(I)}$$

To estimate the average impact on dissatisfaction, a Customer Dissatisfaction Index (DS) is recommended. It is calculated by dividing the sum of the frequencies of Must-be needs (fM) and One-dimensional needs (fO) by the total of the frequencies of Attractive needs (fA), One-dimensional (fO), Must-be (fM), and Indifferent needs (fI). The mathematical expression for DS is given below:

$$DS_i = \frac{f(M) + f(O)}{f(A) + f(O) + f(M) + f(I)}$$

Results and Findings

Initially, a questionnaire was developed using the Kano method, consisting of 15 pairs of questions to identify the needs of Iranian users regarding side-by-side refrigerators, and was distributed among 250 people. Out of this total, 141 complete responses were collected. Table 3 describes different demographic aspects (gender and age) of the same population (total frequency =141 in both). After the initial evaluation, customer needs were ranked for each of the six Kano categories: Attractive, Must-be, One-dimensional, Indifferent, Reverse, and Questionable, as shown in Table 4.

Then, the Customer Satisfaction Index and the Customer Dissatisfaction Index were calculated using the formulas explained in the methodology section and were added as the last two columns in the table for each feature.

Table 3: *Demographic aspects.*

Demographic Summary	Relative Frequency	Cumulative Percentage
Gender		
Female	117	82.9%
Male	24	17%
Total (Gender)	141	100%
Age Group		
18 to 25	41	29 %
26 to 35	55	39%
36 to 45	38	26.9%
46 to 55	7	7%
56 to 65	0	0
Total (Age)	141	100%

Table 4: *Kano evaluation matrix for refrigerator freezer characteristics.*

Customer Requirements (CR)	Refrigerator Feature	O	A	Q	M	I	R	Total	Category	Satisfaction Coefficient	Dissatisfaction Coefficient
CR1	Various color options	10	65	13	6	31	16	141	A	0.66	-0.142
CR2	Separate bread compartment in the freezer	11	74	5	7	41	3	141	A	0.63	-0.135
CR3	Food suggestion system	7	87	6	2	33	6	141	A	0.72	-0.069
CR4	Hot water dispenser	6	83	15	2	18	17	141	A	0.81	-0.07
CR5	Showcase door	4	56	13	3	26	39	141	A	0.67	-0.07
CR6	Expiry date reminder	14	82	21	4	37	124	141	R	0.70	-0.131
CR7	Separate doors for frozen vegetables and frozen meat	6	77	9	2	39	8	141	A	0.66	-0.064
CR8	Freezer compartment dividers (to prevent bags from sticking together)	8	73	3	6	30	21	141	A	0.69	-0.119
CR9	Personal schedule notes with marker	3	59	10	3	44	22	141	A	0.56	-0.055
CR10	Sliding freezer door instead of a hinged	6	50	13	1	41	30	141	A	0.57	-0.071
CR11	Freezer at the bottom	8	30	8	9	53	33	141	I	0.38	-0.17
CR12	Low refrigerator noise	40	34	84	39	22	63	141	Q	0.54	-0.585
CR13	The freezer is larger than the fridge	3	14	14	2	37	71	141	R	0.30	-0.089
CR14	Dedicated snack area for children	13	71	7	3	36	11	141	A	0.68	-0.130
CR15	Lower energy consumption	43	32	88	43	19	57	141	Q	0.54	-0.627

* O = One-dimensional, A = Attractive, Q = Questionable, M = Must-be, I = Indifferent, R = Reverse.

In the next step, the four features with the highest scores were selected and taken to the Analytic Hierarchy Process (AHP) analysis stage. The AHP evaluation steps for weighting the four criteria are as follows:

1. Hot water dispenser next to the cold water nozzle

2. Food suggestion system (based on the available items in the refrigerator)

3. Partitioned freezer compartment (to prevent bags from sticking together inside the freezer)

4. Dedicated section for children's snacks

Table 5: *Preference values in pairwise comparisons.*

Numeric Value	Preference Description
9	Absolutely more important or absolutely preferable
7	Very strongly more important or very strongly preferable
5	Strongly more important or strongly preferable
3	Moderately more important or moderately preferable
1	Equally important or equally preferable
2, 4, 6, 8	Intermediate values between the above scales

Pairwise Comparison of Criteria Concerning the Goal (Consistency Ratio Less than 0.1)

Table 6: *Pairwise comparison of criteria relative to the target.*

Criteria	Hot Water	Food Suggestion System	Freezer Compartmentalization	Children's Access
Hot Water	1	3	5	7
Food Suggestion System	0.33	1	2	4
Freezer Compartmentalization	0.2	0.5	1	2
Children's Access	0.14	0.25	0.5	1

Normalized Matrix

To obtain the normalized matrix:

1. First, we calculate the sum of each column from the table above.

2. Then, we divide the value of each cell by the sum of its column.

Table 7: *Calculating column sum.*

Criteria	Hot Water	Food Suggestion System	Freezer Compartmentalization	Children's Access
Hot Water	1	3	5	7
Food Suggestion System	0.33	1	2	4
Freezer Compartmentalization	0.2	0.5	1	2
Children's Access	0.14	0.25	0.5	1
Column Sum	1.67	4.75	8.5	14

Table 8: *Normalized matrix.*

Criteria	Hot Water	Food Suggestion System	Freezer Compartmentalization	Children's Access
Hot Water	0.59	0.63	0.58	0.5
Food Suggestion System	0.19	0.21	0.23	0.28
Freezer Compartmentalization	0.11	0.10	0.11	1.14
Children's Access	0.038	0.05	0.05	0.07

Weight of Each Criterion

The sum of each row in the normalized matrix, divided by the number of criteria, which is 4 in this case. Thus, the weights of each feature are determined as shown in the table below.

Table 9: *Weight of each feature extracted from the Kano evaluation matrix for refrigerator freezer characteristics.*

	Hot Water	Food Suggestion System	Freezer Compartmentalization	Children's Access	Criterion Weight
Hot Water	0.59	0.63	0.58	0.5	0.57
Food Suggestion System	0.19	0.21	0.23	0.28	0.22
Freezer Compartmentalization	0.11	0.10	0.11	1.14	0.36
Children's Access	0.038	0.05	0.05	0.07	0.05

Table 9 presents the weights of various features extracted from a Kano evaluation matrix for refrigerator freezer characteristics, calculated as the average of each row in the normalized matrix divided by the number of criteria (four in this case). This normalization process ensures that the weights reflect the relative importance of each feature across the criteria: Hot Water, Food Suggestion System, Freezer Compartmentalization, and Children's Access.

- Hot Water: This feature weighs 0.57, indicating moderate importance. Its highest score (0.63) under the Food Suggestion System criterion suggests it is particularly valued in that context, though it shows consistent relevance across all criteria (ranging from 0.5 to 0.63).
- Food Suggestion System: With a weight of 0.22, this feature is less critical overall. Its scores range from 0.19 to 0.28, with the highest under Children's Access (0.28), implying a niche relevance for this user group.
- Freezer Compartmentalization: This feature stands out with a weight of 0.36, reflecting its significant importance. The highest score (1.14) under Children's Access highlights its critical role in ensuring safety and usability for children, with scores ranging from 0.11 to 1.14.
- Children's Access: This feature has the lowest weight of 0.05, indicating minimal overall importance. Its scores are consistently low (0.05 to 0.38), with the highest under Hot Water (0.38), suggesting limited impact across criteria.

The weights demonstrate that Freezer Compartmentalization and Hot Water are the most valued features, likely due to their functional and safety implications, while Food Suggestion System and Children's Access are less prioritized. This analysis aids in guiding design decisions by highlighting features that align with user preferences derived from the Kano model.

Conclusion

The way people in Iran use refrigerator-freezers is closely tied to their cultural habits and daily routines. This research found that local practices around storing food are quite specific, and they reflect deeper patterns shaped by family life and traditional values. Because of these differences, product designs that work well in one context might not suit users in another. This reinforces the value of developing appliances that truly reflect the lifestyle of the people using them. To better understand user expectations, the study used the Kano model, which helped sort feedback based on what people find essential versus what simply adds value. Out of this process, four design elements stood out as priorities for Iranian households. One suggestion that came up often was having both hot and cold water available from the fridge, something that makes a lot of sense in a place where tea and herbal drinks are part of everyday life. Another idea people liked was a feature that could look at what's already in the fridge and help with deciding what to cook, which would be useful for reducing waste and saving time. There was also interest in changing how the freezer is arranged. People talked about how food often ends up stuck together, so they wanted separate spaces for different types of items, like meats or bread.

Lastly, many parents mentioned how helpful it would be to have a snack area just for kids, low enough for them to reach but still safe and durable. While all four features reflect functional enhancements, their cultural resonance varies. The hot water dispenser, for instance, is deeply tied to daily tea rituals. In contrast, features like the food suggestion system address emerging lifestyle needs, such as time-saving and reducing food waste. Acknowledging this variation highlights the evolving nature of cultural design. These suggestions aren't just features, they reflect a deeper understanding of how people live, cook, and share meals in their homes. They also point to ways companies can better connect with their users by designing appliances that feel familiar and useful, not just functional. As a whole, the study shows that being mindful of cultural context leads to products that resonate more with users. For manufacturers hoping to build stronger connections with local markets, this kind of design thinking could make a real difference.

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