

Research on Emotional Design of Food Systems Based on Emotion-Cognition Theory

Beibei Wang

Dalian University of Technology, Dalian, Liaoning 116024, China

Abstract: This research, grounded in the emotion-cognition theory, conducts an in-depth exploration of the emotional design in food systems. Through a meticulous clarification of the theoretical underpinnings of this theory, it uncovers the intricate internal relationships between food and emotions, delving into the mechanisms by which food systems elicit emotional reactions and fulfill consumers' emotional needs. Drawing on the three aspects of capability, behavior, and reflection, this research puts forward a three-layered design strategy, with the intention of integrating theory and practice in novel and creative manners. Furthermore, this study systematically analyzes the existing challenges and forthcoming trends in the emotional design of food systems. By doing so, it not only offers robust theoretical support but also provides practical and actionable guidance for emotional design within the food system domain, thereby significantly driving innovation in this burgeoning field.

Keywords: Emotion-Cognition Theory; Emotional Design; User Experience; Eating Behavior; Sensory Design.

1. Introduction

In human life, food is not only the material foundation for sustaining life but also a vessel of rich emotional experiences. From the warmth of family meals to the solemnity of ceremonial banquets, food plays a vital role in conveying emotions. As consumption levels rise and cultures diversify, consumers' demands for food have exceeded basic physiological needs, seeking emotional resonance and spiritual satisfaction. In this context, emotional design in food systems has become a research field with high value and broad prospects. Emotions not only affect individuals' appetite and food choices but also influence eating behavior through cognitive mechanisms. Reflecting on eating experiences can further regulate emotional states. [1] Therefore, applying emotion-cognition theory to the emotional design of food systems can help uncover consumers' emotional needs and build emotionally valuable food system experiences, offering theoretical foundations and innovative directions.

2. Food System Design: Current Status and Demand

2.1. The Current Status of Emotionalization in Food Systems

At present, many aspects of food systems have already incorporated emotional design concepts. In food packaging, many brands skillfully use color, shape, imagery, and text to convey emotional messages. For example, some children's food packaging uses bright colors such as green, orange, or warm red tones, paired with cute cartoon images like bunnies or elves to capture children's attention and activate their affection for food.

In intelligent dining systems, emotional design is applied by offering personalized meal recommendations based on recorded preferences, dietary habits, and taste profiles. This provides users with a sense of care and understanding. Some high-end restaurants enhance their menus with delicate paper materials, elegant typography, and hand-drawn illustrations, pairing them with ambient music and lighting to create a

unique and emotionally immersive dining atmosphere. Consumers, during ordering, are subtly influenced by these emotional cues, enhancing their sense of satisfaction and brand memory.

As society becomes increasingly fast-paced and uncertain, people's demands for food are shifting from merely physiological satisfaction to emotional and psychological needs. In stressful environments or emotionally tense states, emotionalized food experiences become a way to relieve pressure and restore emotional balance.[10] Therefore, emotional design in food systems is not only about satisfying basic consumption needs but also about deeply understanding and responding to consumers' emotional desires. By using delicate emotional techniques, designers can build emotional bridges between people and food, making food not just an intake of nutrients, but also an emotional ritual and expression.

2.2. Exploration of Emotional Needs for Food among Consumers

With increasing social pressure, emotional eating behavior is becoming a typical phenomenon, especially among young people. Research shows that this group tends to consume high-sugar or high-fat foods during stress or loneliness, seeking short-term comfort.[3] Modern consumers have diverse emotional demands for food in different life scenarios. In social settings, food acts as a medium for interaction—people tend to share their meals or dining environments, using food to enhance social connection and strengthen relationships. For instance, in a dinner party, beautifully crafted desserts or creative cakes can become lively conversation starters and emotional links among participants. In solitary moments, food often becomes an emotional companion—people lean toward foods that bring comfort and warmth, like a cup of hot chocolate or soft bread, meeting their inner need for emotional soothing. For busy commuters, convenient yet satisfying foods like nutritious energy bars help them cope with pressure and provide emotional support amidst the fast pace of life. Therefore, these evolving emotional needs reflect consumers' pursuit of quality living, and highlight the necessity and significance of emotional design in food systems.

At the same time, emotionalized food systems play an important role in enhancing the quality of life and promoting social harmony and development.

3. Related Concepts: Definitions and Analysis

3.1. Emotion-Cognition Theory

Emotion-cognition theory holds that emotions are not purely triggered by external stimuli, but rather result from cognitive evaluations of stimuli experienced by the individual. Different emotion-cognition theories explore this process from various angles:

Magda Arnold's "appraisal theory" suggests that stimulus environments don't directly determine emotional qualities. Instead, the emergence of emotion requires a two-step process: stimulus — evaluation — emotion.

O-S (stimulus–organism–response) models further propose that emotion arises from the evaluation of stimulus events and

results in emotional expression and cognitive feedback.[2]For example, when consumers encounter a new food packaging, they may first assess its color, imagery, and visual style. If these elements evoke associations with pleasant memories or joyful contexts, they can trigger positive emotions.

Stanley Schachter's "two-factor theory" emphasizes two key conditions for emotional arousal:

1·The individual must physiologically experience arousal.

2·The individual must cognitively interpret that arousal based on the situation.

In food-related scenarios, the aroma of a dish can spark biological hunger (physiological arousal), and the consumer's recognition of that dish can trigger pleasurable emotions (cognitive interpretation). These theories provide a solid foundation for understanding the subtle and complex links between food and emotion, enabling us to delve into consumers' emotional responses in the process of food selection and consumption from both cognitive and perceptual levels.

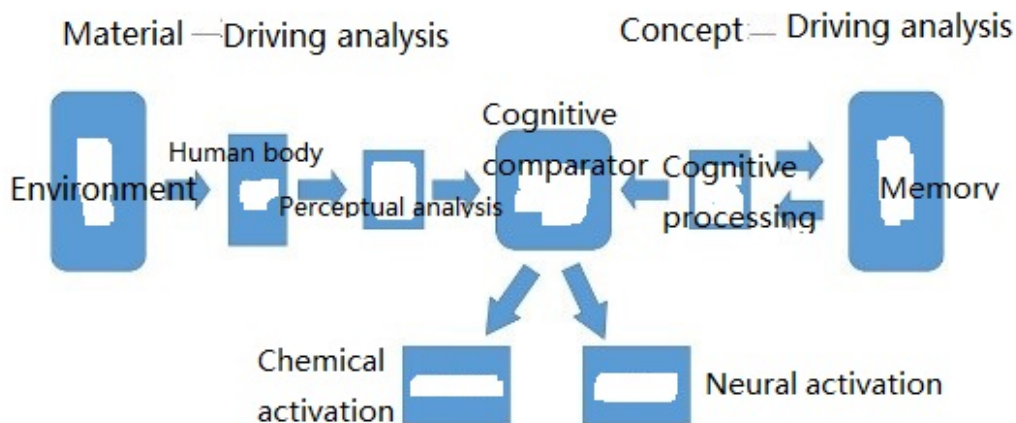


Figure 1. Emotional Arousal Model (Illustrated by the Author)

3.2. Food System Design

Food system design refers to applying systems thinking and design methodology to the processes of food production, processing, distribution, consumption, and waste management. It involves integrated planning and optimization across all stages of the food cycle. Its aim is to realize goals such as high efficiency, sustainability, health, and fairness by considering ecological environments, social culture, economic development, and other factors. Through innovative strategies and methods, it seeks to design a more reasonable food system structure to meet people's diverse food needs while minimizing environmental impact and promoting harmonious societal development.

4. Emotional Design Dimensions and Strategies within Food Systems

4.1. Perception Layer: Sensory - Oriented Design Tactics

The perception layer of design is primarily centered around engaging consumers' five senses - sight, hearing, smell, taste, and touch. By harnessing sensory stimuli, this layer aims to

evoke emotional reactions.

Research indicates that food experiences can be segmented into five distinct dimensions: sensation, function, interaction, emotion, and cognition. These dimensions effectively elucidate the dynamic relationship between users and food at various stages.[4] In the realm of design, color serves as the most immediate conduit for emotions. Warm hues, such as red and orange, typically signify energy and warmth, while cool colors like green and blue evoke a sense of calmness and freshness.

For instance, packaging for fruit juices commonly employs vivid, fruit - related colors such as orange, green, and blue to convey natural freshness. Shapes and materials also play a pivotal role in eliciting emotional perceptions. Rounded shapes are often associated with softness and approachability, whereas sharp edges may pique curiosity or create a sense of stimulation. Material attributes, including texture, temperature, and structure, act as primary sensory triggers, intensifying the initial emotional response. Sensory design can be further classified into two key approaches: "multi - sensory augmentation" and "cross - sensory compensation." The former deepens the user's immersive experience through an abundance of sensory inputs, while the latter compensates for the absence of one sense by stimulating another.[7]



Figure 2. Design of the Food System from the Perspective of Emotion Cognition - Drawn by the Author

4.2. Behavior Layer: Designing for Interactive Experience

This layer emphasizes usability and interactivity of products. In food systems, enhancing interaction elements can significantly boost consumers’ emotional engagement. Compared to singular emotional triggers, experiences with game-like or immersive qualities are more likely to activate emotional responses. Some studies have proposed that interactive environments can induce emotions like surprise, delight, curiosity, etc., especially through well-constructed “emotion-cognition collision” moments. These emotional stimuli, when embedded into interactions, gradually intensify and transform into a joyful immersive experience, forming deep emotional memories.[5] For example, some children's food packaging incorporates interactive features such as small puzzles or games inside the packaging. While enjoying the food, children are driven by curiosity and actively engage in play, increasing fun and involvement. Some food brands have launched combined online and offline interactive activities. By scanning the QR codes on the packaging, consumers can join recipe tutorials, food photography contests, and more. This not only strengthens the bond between brand and consumer, but also fulfills users’ needs to express themselves and share their lifestyles. In dining scenarios, some restaurants offer DIY cooking areas, allowing customers to participate in the preparation of certain dishes. This hands-on experience builds a deeper emotional connection with the food, enhancing satisfaction and brand loyalty. Emotional evolution throughout interaction does not rely solely on logical functions—it requires a compound experience generated through the collaboration of sensory and cognitive layers. Studies show that when visual and olfactory stimuli are emotionally aligned, user reactions become more intense. Conversely, conflicting stimuli can induce surprise or complex mixed emotions, deepening immersion.[6] Through such interactive design, consumers transition from passive recipients of food to active participants, gaining a sense of achievement and pleasure in the process, while strengthening their emotional identification with the food and its associated brand.

4.3. Reflection Layer: Designing for Emotional Resonance

This layer focuses on cultural heritage, value expression, and consumer self-awareness. Many food brands evoke emotional resonance by integrating traditional cultural elements. For example, traditional festival foods such as mooncakes (Mid-Autumn Festival) and zongzi (Dragon Boat Festival) often retain traditional flavors and packaging while embracing modern aesthetics. Mooncake boxes may use traditional Chinese painting styles to depict classic scenes like Chang’e flying to the moon or the Jade Rabbit pounding medicine, allowing consumers to feel the richness of festival atmosphere and cultural heritage while enjoying the food. This evokes feelings of nostalgia and family reunion. Some food brands also promote values such as health, environmental protection, and sustainability by using biodegradable packaging and organic ingredients. These practices resonate with consumers who share similar beliefs. When purchasing such products, consumers not only fulfill their dietary needs but also express alignment with these values through their consumption behavior. As a result, they form deeper emotional connections with the brand, enhancing both brand loyalty and their own sense of identity.

5. Case Study: RICEMAN Rice Packaging

5.1. Project Background and Design Goals

In today’s food retail market, product packaging is no longer merely a tool for protection and transportation—it has become a crucial medium for building emotional connections between brands and consumers. Especially in the field of traditional agricultural products such as rice, market competition is increasingly fierce, and product homogenization is widespread. Traditional packaging forms have gradually lost the ability to spark consumer interest or emotional resonance. In this context, the RICEMAN rice packaging design project emerged. The goal of the project is to break away from the rigid, stereotypical image of

conventional rice packaging by using innovative visual language and material expression techniques, and to endow the product with a more personified and emotional form of expression. This design pays attention not only to aesthetics and functionality, but also seeks to evoke consumers' respect and emotional identification toward agriculture, farmers, land, and food itself through visual storytelling and cultural symbolism. The project was led by the creative team at Prompt Design Studio, and it confronted a product category described as “humble yet emotionally barren.” Their ambition was to create a design that, through figurative and anthropomorphic visual elements, could convey warmth, sentiment, and care even within a highly globalized retail environment. This directly aligns with the emotional consumption era, where consumers increasingly expect products to possess “warmth” and “personality.”

5.2. Design Objectives

5.2.1. Evoking Emotional Resonance and Reframing the Value of Grain

In the experience economy era, consumer demand has shifted from purely functional consumption to a pursuit of emotional experiences. According to experiential consumption theory, concretized and contextualized packaging design can effectively create immersive emotional experiences for consumers, reshaping their interaction with traditional products like rice. By embedding narrative elements into the design, rice is given personified traits and storytelling value. When consumers open the package, these elements evoke associations—scenes of fields, sunlight, and labor coalesce into vivid mental imagery. This process enhances their perception of the value of grain, prompting a shift from focusing solely on material attributes to recognizing its emotional and cultural significance. For instance, the RICEMAN rice packaging illustrates scenes of hardworking farmers and includes detailed planting stories, fostering emotional resonance and increasing the product's emotional value.

5.2.2. Integrating Cultural Symbols to Express Brand Sentiment

The design draws inspiration from Asian agrarian culture, particularly the conical straw hat (douli) and traditional burlap textures. Using cross-cultural communication theory, these cultural elements are translated into the visual language of the packaging. The top of the box mimics the shape of a straw hat—an aesthetic form that not only stands out visually but also pays tribute to agricultural laborers. This visual symbol is simple and intuitive, and due to its cultural universality, it can be widely understood and appreciated across different cultural contexts. It evokes cultural identity among domestic consumers and draws attention in international markets. Furthermore, the anthropomorphic design narrows the psychological distance between the product and consumers, enhancing the brand's approachability across cultural backgrounds.

For example, a Japanese rice brand incorporated washi paper and samurai helmet motifs into its packaging, successfully building a distinctive brand image both locally and globally. Such anthropomorphic designs bring the product emotionally closer to consumers, making the brand more memorable and emotionally engaging.

5.2.3. Emphasizing Sustainability and Inspiring Reflective Consumption

With the growing awareness of environmental protection,

green consumption values have taken root deeper in consumers' minds. Based on the theory of green consumption, this design adopts environmentally - friendly and biodegradable materials, and adheres to the design principle of "simple yet refined", reducing the environmental impact at the source. This not only complies with ecological standards but also prompts consumers to reflect on sustainability. When consumers choose products with sustainable packaging, they strengthen their own green values and consider the act of purchasing as a manifestation of support for sustainable development. For example, a Swedish food brand has adopted edible packaging materials, which not only fulfill the basic functions of packaging but also significantly reduce waste, encourage consumers to develop eco - conscious habits, and promote the industry to move towards sustainable innovation.

5.3. Design Strategy Analysis

5.3.1. Visceral Layer: Sensory-Driven Emotional Arousal

At the visceral level, RICEMAN's packaging fully stimulates consumers' sensory perception through combined visual and tactile stimuli, triggering instinctive emotional responses and product affinity. The packaging features a simple cartoon silhouette of a farmer, using subtle and warm tones—primarily light brown burlap and the natural beige color of kraft paper—evoking a sense of purity, modesty, and rustic elegance, in line with rice's identity as a basic, essential grain. In addition, the texture of rough burlap wrapping stands in contrast to the smooth plastic typically used in food packaging. It simulates the texture of a farmer's clothing, evoking vivid imagery of working in the fields and nostalgic emotional memories tied to the land and harvest.

These non-verbal sensory cues quickly transmit emotional signals, allowing consumers to form warm, intimate psychological impressions and stimulating purchase motivation.

5.3.2. Behavioral Layer: Engagement and Understanding Through Use

On the behavioral level, RICEMAN's packaging is not a static object, but an invitation to participate—a ritual of interaction. The unboxing experience is carefully designed: to open it, users must untie the burlap cloth and lift the “conical hat” lid, simulating the action of uncovering a farmer's straw hat. This symbolic gesture draws the consumer into a process of “meeting” the rice, intensifying psychological involvement and creating immersion. The packaging also includes brief brand narratives, detailing rice cultivation processes or stories from the place of origin. This transforms consumers from passive recipients into informed participants, fostering understanding, respect, and emotional resonance. Through engaging structures and modular combinations, users reconstruct the meaning of food during interaction, leading to deeper emotional engagement. Research has proposed the “PRGD” model, encouraging users to actively explore, express, and communicate during mealtime, breaking conventional consumption habits and enabling both participation and empathy. [8]Such behavioral design extends user-product contact time and enhances emotional depth and memorability.

5.3.3. Reflective Layer: Cultural Identity and Emotional Resonance

The deepest emotional strategy in RICEMAN's design lies in the reflective layer—evoking emotional identity through cultural metaphors and value projection. The packaging's shape mimics the traditional conical hat worn by Asian

farmers, a form rich in visual recognition and cultural symbolism. It not only honors the identity of agricultural workers but also reflects respect for traditional farming practices. The design further responds to Eastern dietary philosophy, particularly the belief that “rice is fundamental.” It invites consumers to reflect on the origins and meaning of food, rekindling a sense of reverence between people and nature, and between people and grain. The brand also promotes sustainability by using biodegradable and recyclable materials, reinforcing environmental consciousness. This multi-layered design not only builds emotional connections on the sensory and behavioral levels, but also forms a deep psychological bond on the value level—transforming a bag of rice into a statement of attitude and cultural identity.

5.4. Case Summary and Strategic Reflection

The RICEMAN project was developed based on the three-layer structure of emotion-cognition theory, applying emotional strategies across instinctive sensory stimulation, interactive behavioral engagement, and reflective value expression within specific food-related contexts. The case demonstrates that emotion-cognition theory can be effectively translated into tiered and executable design strategies, enabling users to experience progressive immersion through perception, understanding, and resonance during the entire process of interaction. Designers in this context go beyond the role of aesthetic creators—they act as guides and coordinators of the experience system, establishing a comprehensive emotional response mechanism between multisensory triggers and the communication of cultural meanings. [11]

6. Conclusion

Emotional design within food systems is emerging as a crucial field of future design research, as it closely ties the material nature of food with consumers' emotional needs. Emotion-cognition theory offers profound theoretical insights for this domain, helping us understand how food influences consumer behavior through the interaction of cognition and emotion. By building emotional design strategies across the visceral, behavioral, and reflective layers, and deeply integrating emotion-cognition theory into design practice, we can create food systems that offer greater emotional value and are better aligned with consumer expectations. Although challenges remain, the continued advancement of technology, deepening interdisciplinary collaboration, and evolving consumer demands signal a promising future for emotional

design in food systems. Future emotional food system design should no longer be limited to taste satisfaction, but should evolve into a comprehensive system connecting emotional experience, social structure, and cultural identity. Studies indicate that the food industry is moving toward multi-dimensional integration, combining nutritional structure, perceptual science, and emotional resonance mechanisms—these will become the key drivers of enhanced dining experiences. [9] We look forward to seeing more innovative food products and services that not only satisfy the palate, but also warm the heart, contributing meaningfully to the quality of human life.

References

- [1] Zhou, A. B. , & Zhu, W. J. (2021). The influence of emotion on eating behavior: theory and mechanism. **Chinese Journal of Health Psychology**, 29(6), 853–857.
- [2] Ho, A. G. , & Siu, K. W. M. (2012). Emotion Design, Emotional Design, Emotionalize Design: A Review on Their Relationships from a New Perspective. **The Design Journal**, 15(1), 9–32.
- [3] Li, Y. J. , & Deng, R. (2023). Research on tableware experience design strategy from the perspective of emotion - cognition. **Design**, 36(7), 76–79.
- [4] Ge, S. Y. , & Liu, Y. K. (2024). Research on the experience composition of baked food from the perspective of food design. **Design**, 37(8), 52–54.
- [5] Qin, S. K. (2023). Research and practice on food design based on cognitive emotion. **Master's thesis**, Sichuan Fine Arts Institute.
- [6] Braun, M. H. , Pradana, G. A. , Buchanan, G. , et al. (2016). Emotional priming of digital images through mobile telesmell and virtual food. **International Journal of Food Design**, 1(1), 29–45.
- [7] Xu, N. (2020). Research on the application of sensory experience in food design. **Design**, (2), 88–90.
- [8] Wilde, D. , & Bertran, F. A. (2019). Participatory research through gastronomy design: A designerly move towards more playful gastronomy. **International Journal of Food Design**, 4(1), 3–37.
- [9] Li, Z. F. , Kong, H. C. , Liu, Y. F. , et al. (2022). Future food: Opportunities and challenges. **Journal of Chinese Institute of Food Science and Technology**, 22(4), 1–13.
- [10] Liu, J. Y., & He, S. F. (2022). The enlightenment of the pandemic: The development direction of future food design. **Design**, (1), 111–113.
- [11] Schifferstein, H. N. J. (2016). What design can bring to the food industry. **International Journal of Food Design**, 1(2), 103–134.